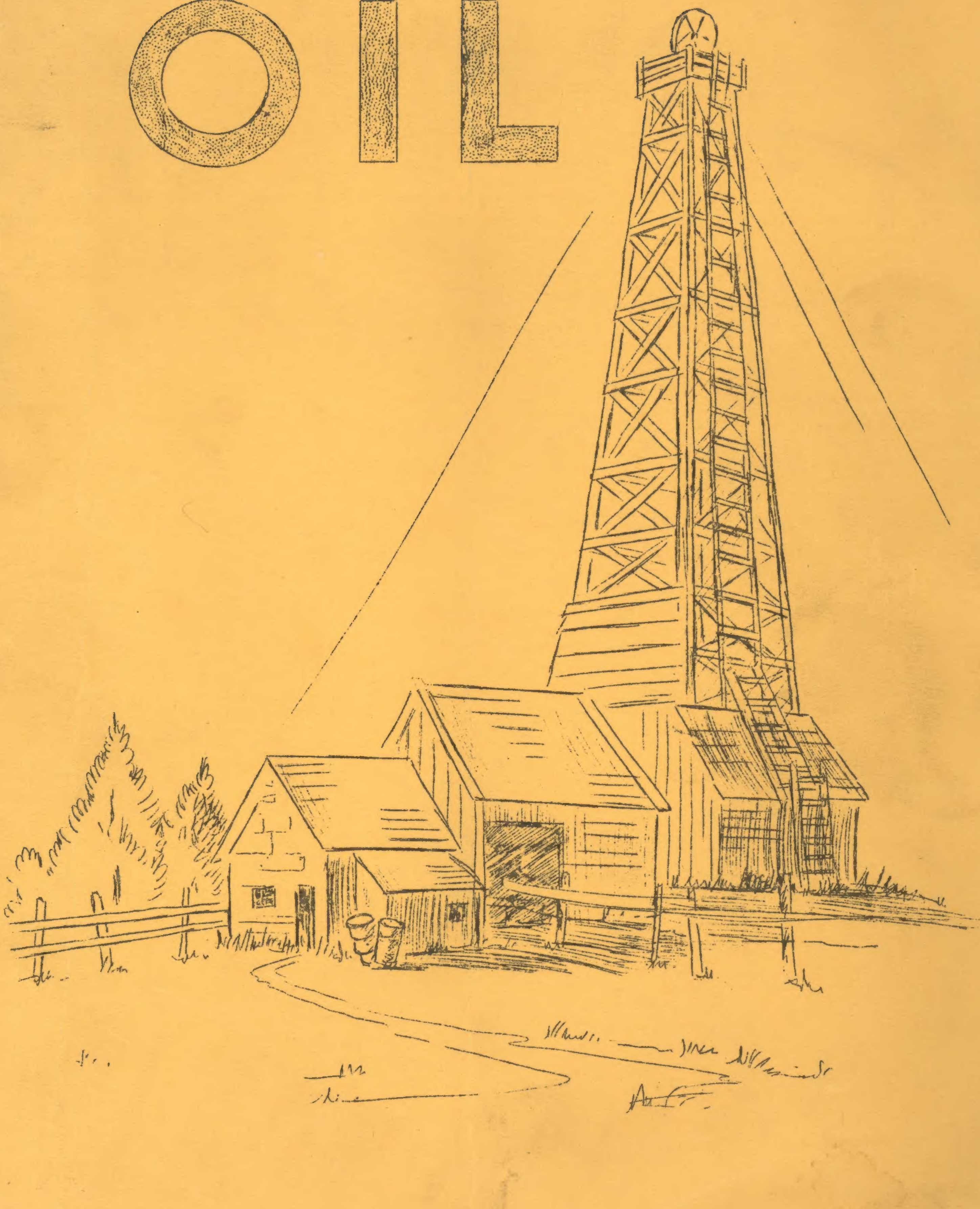
OIL



OIL ENTERPRISE

The teacher of today needs a wealth of material from which the child can gain knowledge. Books written so that a child may easily garner the salient facts are not available to all school children. Hence we present this Enterprise on oil, containing many interesting facts about the Oil Industry which the child will be able to read for himself.

We have included suggestions for activities from which the teacher may choose those suitable to her children and class. Very probably you will add to these, many original and instructive ideas of your own.

If you can direct your children to see the part played by this one factor in world affairs--so that all of their knowledge is directed towards an understanding of conditions today; then it will be of very great benefit indeed as a basis for their social studies work of the Junior High School.

Reference Material

Calgary Public Library.

Oil Comes to Us. -- Rose Wyler and Warren W. McSpadden.

The Story Book of Oil. -- Maud and Miska Petersham.

Petroleum. -- No. 1. of the Industry Series.

Oil Production. -- Johnson.

Oil Finding. -- Craig.

Oil Enterprise

Problem I. -- History of Oil.

Problem 2. -- Uses of oil showing importance to trade and industry.

Problem 3. -- Centres where oil is found.

Problem 4. -- Process of Drilling for Oil.

Problem 5. -- Refining and Transportation of Oil.

PROBLEM I

History of Oil

Lessons

1. The teacher should give a lesson showing her pupils the interdependence of nations and of industries, using oil as an illustration.
   (a) The part played by oil in the Second Great War.
   (b) The struggle of the warring nations to obtain supplies of oil from existing fields, exploration of new fields, by synthetic methods.
2. Art Lessons on figure drawing -- to be used in drawing Cave-men, Indians, Persians, Egyptians, showing their use of petroleum.
3. Business Letters.
4. Hygiene -- How native N.A. Indians treated disease.

Activities

1. Begin Booklets on Oil.
2. Illustrations for booklets.
3. Write letters asking for information to the oil companies at Turner Valley, Edmonton, etc.
4. Prepare reports on each of these countries and their early use of oil -- Greece, Egypt, United States, Persia.
5. Make a large world map and locate each of the countries mentioned.
6. Prepare reports on how oil was formed. Mark these as compositions
7. Teach Expositions. (Composition).
8. Have children read: "The Gusher" -- Page 121 in Proud Processions
9. Have children write poems. See examples from a very limited class in a rural school.

PROBLEM 2

Use of Oil

Lessons

1. Art -- Teach perspective. Have pupils draw illustrations for the various uses of oil.
2. Narrative Compositions -- The Story of a gallon of Petroleum.
3. Arithmetic Lesson on Graphs.
4. Lesson on steamships, automobiles, kerosine lamps, and tractors, showing the use of petroleum products in the running of each.
5. A lesson on cleanliness and the skin. The use of oil in shaving cream, vaseline, ointment for burns, etc., may be introduced here. Treatment for burns taught.
6. Teach road building. Give the life of Macadem -- Tell of the old Roman Roads -- Show how the use of asphalt has made paved roads possible.

Activities.

1. Illustrations of automobiles, steamships, aeroplanes, made by one committee. Another will illustrate drug products. Still another committee will draw the kerosene lamp.
2. Graphs showing comparative production of various world centres and comparative uses of various by-products of petroleum are made.
3. Children make diagrams of the cylinders in cars, tractors, etc.
4. Additions for the oil booklet are made in hygiene section.
5. Advertisements and articles from magazines showing the uses of oil are collected for the booklet.
6. Children begin the co nstruction of an oil derrick, refinery, transportation facilities by drawing careful plans to scale.

PROBLEM 3

Centres where Oil is found

This problem lends itself to a splendid Geography lesson.

1. Draw maps of the world marking the oil centres. Teacher will review the continents, oceans, a nd countries of the world.
2. A careful study of Peru, Persia, U.S.A. or any three great oil centres should be made.

Activities

1. Each pupil makes a small map for booklet marking the oil centres. Small derricks will mark the oil centres in a colorful manner.
2. The class constructs a large flour and salt map of the world.
3. Each child chooses three great centres of oil production and studies these in detail learning of the people, customs, history, climate, industries.
4. The child prepares these for booklet with illustrations.
5. Children are given five of the leading nations of the world.
   e.g. France
   Russia
   England
   China
   U.S.A.

   They are required to find the source of supply for petroleum products of each nation -- the amount used -- imported, exported. This will probably entail the use of business letters to obtain the desired information.
6. The class should locate on a map the Saudi Arabian fields and discuss the part they played in the Second Great War.

PROBLEM 4.

Process of Drilling for Oil

Lessons.

1. A lesson explaining how oil is obtained compared with the mining of coal.
2. A lesson on salt mining.
3. An art lesson reviewing perspective.

Activities.

1. This problem is the one in which the children do the largest proportion of their work on the oil field. They will construct the derrick, paint it--make a refinery and all other things necessary for illustrating the oil field.
2. The children draw derricks, refineries, etc. for their booklets.
3. They prepare reports on drilling for oil, mining coal, mining salt.

PROBLEM 5.

Refining and Transportation of Oil.

Lessons.

1. Science--Teach children liquids, solids, and gases. Explain to them carefully by diagram how oil is refined.
2. Composition--Review the business letter, editorial, kinds of compositions descriptive, narrative, expositive. Teach the argumentative composition.
3. History--Trace the transportation of oil from earliest times to the present. This will obviate the teaching of the growth of transportation on land and sea.
4. Spelling--Review all the words previously taught. Have tests and be sure the pupils have a sound knowledge of all the difficult words they use in the enterprise.

Activities.

1. The major activity will be the completion of the miniature oil field. This would be an excellent exhibit for School Fair.
2. Children construct a plant for the refining of oil.
3. Children write expositions on refining oil for their booklets.
4. Children write argumentative compositions on such topics as:
   (a) Transporting oil by pipe line is better than by truck.
   (b) Oil is more of a necessity to industry than coal.
5. Booklets are completed.
6. The display of the oil derrick, refinery, oil truck, oil tanks for trains is completed.

HOW OIL WAS FORMED

Before man prepares oil for his own use it is called 'Petroleum'.

Hundreds of thousands of years before man was upon earth, queer-looking animals lived in forests. In the seas were many strange kinds of fish and serpents. There were also countless millions of plants and animals too small to be seen.

As these plants and animals died, they lay buried in mud. Ancient rivers, flowing through the forests into the oceans, deposited upon the bottom of the sea layer upon layer of the remains of plant and animal live.

Buried down under the salt water for ages, the mud and silt turned into rock, and the plant and animal remains became oil.

But the oil did not stay down under the sea bottom, for there came a time when earth-quakes crumpled and twisted the crust of the earth up and down. High mountains sank and were covered with water. The bottom of the seas was pushed up and became the plains and mountains of today. The layers of rock containing the oil were crushed and pushed about.

There, out of sight underneath the surface of the earth, this oil, often mixed with salt water and gas, formed into pockets or pools. It passed through crevices and cracks in the rocks and soaked into porous rock and sand, as water goes into a sponge. There were certain kinds of rock through which the oil could not make its way, and here it was imprisoned as in a trap.

Today men find oil hidden in these prisons and drill down through rock to get it.

USES OF OIL

(a) Uses of Oil in Earliest Times.

The ancient men of Persia were fire worshippers. In certain places near the Caspian Sea and the Mediterranean Sea a gas made its way out of the ground through crevices in the rocks, and it burned with a bright flame. The men who worshiped fire thought these rocks must be the homes of their fire god, and so they built temples over the flames.

Today, much oil has been found, near the places where the temples stood so long ago.

Noah is said to have used tar, a kind of oil on the inside and outside of the Ark--to make it waterproof.

King Solomon used tar between the huge stones with which he built the temple.

Our Indians, red-skins, were using oil as medicine when white settlers came.

The Indians collected this oil from pools where it had seeped through the rocks to the earth's surface and floated on the water. They dipped their blankets into the water with great care. Then they wrung the oil from the blanket into a clay pot.

Early American settlers learned from the Indians to use this oil, and even in 1800 it was sold in stores as Indian medicine.

The Ancient Greeks used oil in warfare. The armies made it a practice to seize as many swine as possible, they poured "rock oil" over them and when they were well soaked, set fire to them. The flaming swine were then driven into the enemy camp so that tents of the enemy caught fire and were destroyed.

A most interesting early use of oil was in the wrapping of mummies. Strips of cloth for wrapping the bodies were soaked in

petroleum before being used, the petroleum serving as a preserving agent. It has been told that hundreds of years after some of these preserved bodies were laid in their tombs, along came their descendants and the new inhabitants of the land, and the tombs were broken into for the valuables that they contained. It was soon discovered that the mummies, themselves, burned well and made a very hot fire. Since the mummies made such excellent fires, there soon grew up a thriving business among the more money-seeking tradesmen--the business of selling mummies or their wrappings for common fuel.

When the American Colonies were fighting for their independence from Great Britain, stories tell us how the American soldiers marching in the Pennsylvania wilderness stopped at oil springs along a creek to ease their sores by rubbing them with the oil they found there.

MODERN USES OF OIL

(a) Gasoline.

It is because of oil and its products that engines of light weight were developed, and because of these engines, airplanes were made to fly and automobiles to run. Ships cross the oceans and trains cross the continents, driven by oil engines. Tractors, which do the work of many, many horses, are run with gasoline. Many farm homes are lighted by gasoline lamps.

(b) Oil.

Oil, as well as being used in automobiles, steamships and tractors is also used in shaving cream, face creams, vaseline, mineral oil, paint, varnish, wax, telephone poles, oil burners, rubbing alcohol, hand lotion, lip-sticks, ointments for burns, salves for chapped lips. In fact you will find petroleum products in every store, in every house, and on every street you pass.

(c) Asphalt, too, is widely used. Your streets are paved with asphalt. Some kinds of chewing gum contain paraffin. Chocolate covered ice-cream bars must have paraffin, as ordinary chocolate would melt before the syrup would harden.

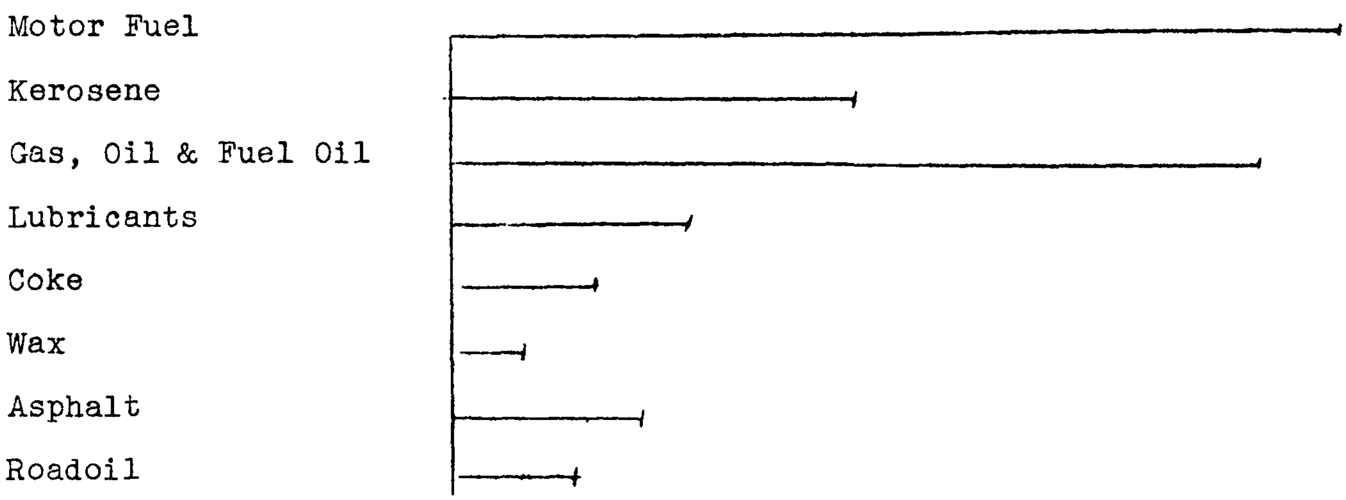
Have you now some conception of the varied uses of all the products of petroleum? Do you realize that the world would be dazed if the use of this product was curtained? Do you see why nations desperately seek for sources not only for the present but future supplies of the Black Gold -- OIL?

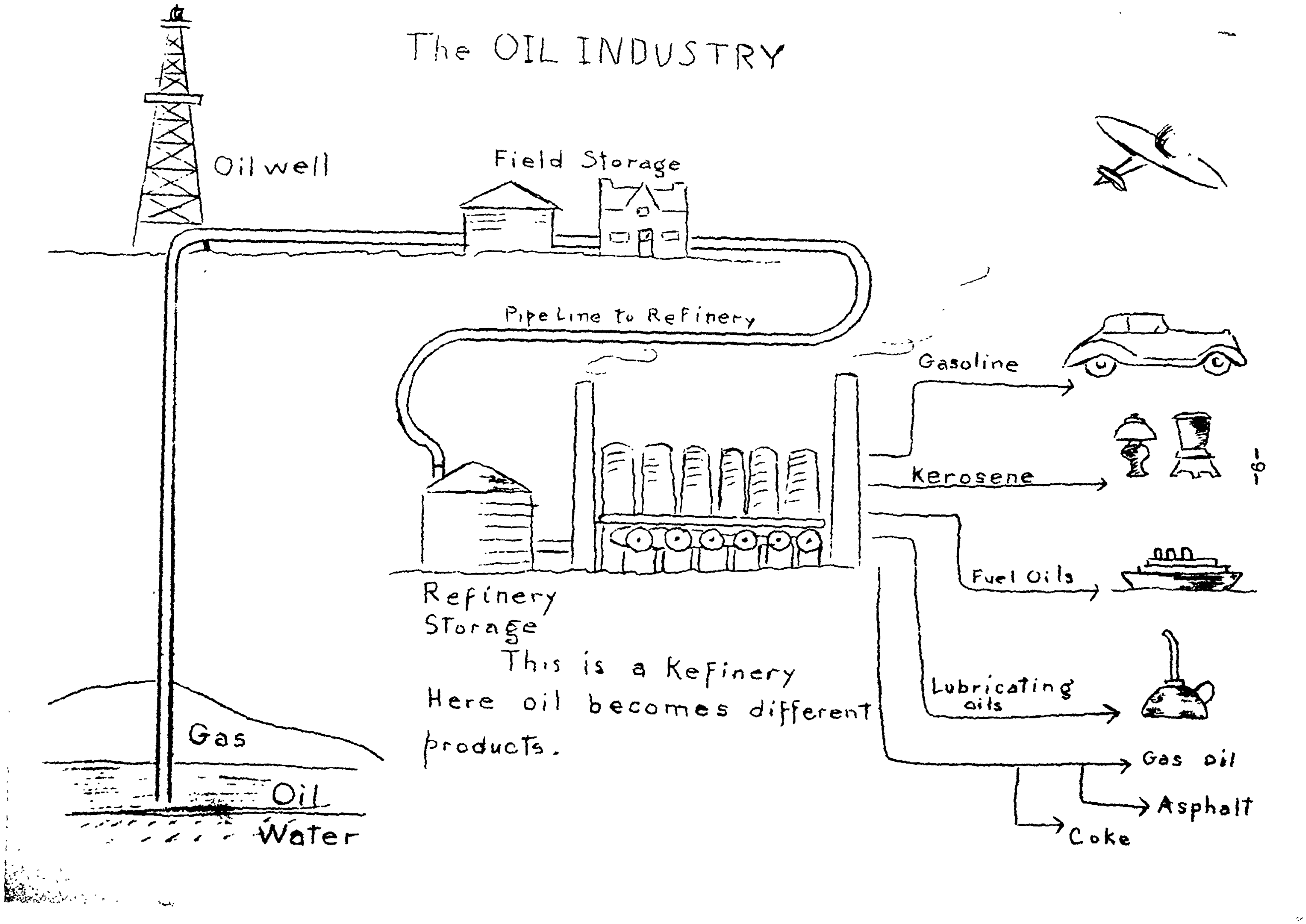
The Petroleum Industry is an institution. It employs thousands of men--thousands of chemists, thousands of engineers, thousands of geologists, thousands of common workers. Petroleum is hundreds of things--an employer, a doctor, a financier, a household helper-- almost

anything that can be named. The world without it would be almost paralyzed, but with it man has only to use it properly to add untold comfort and happiness to his life.

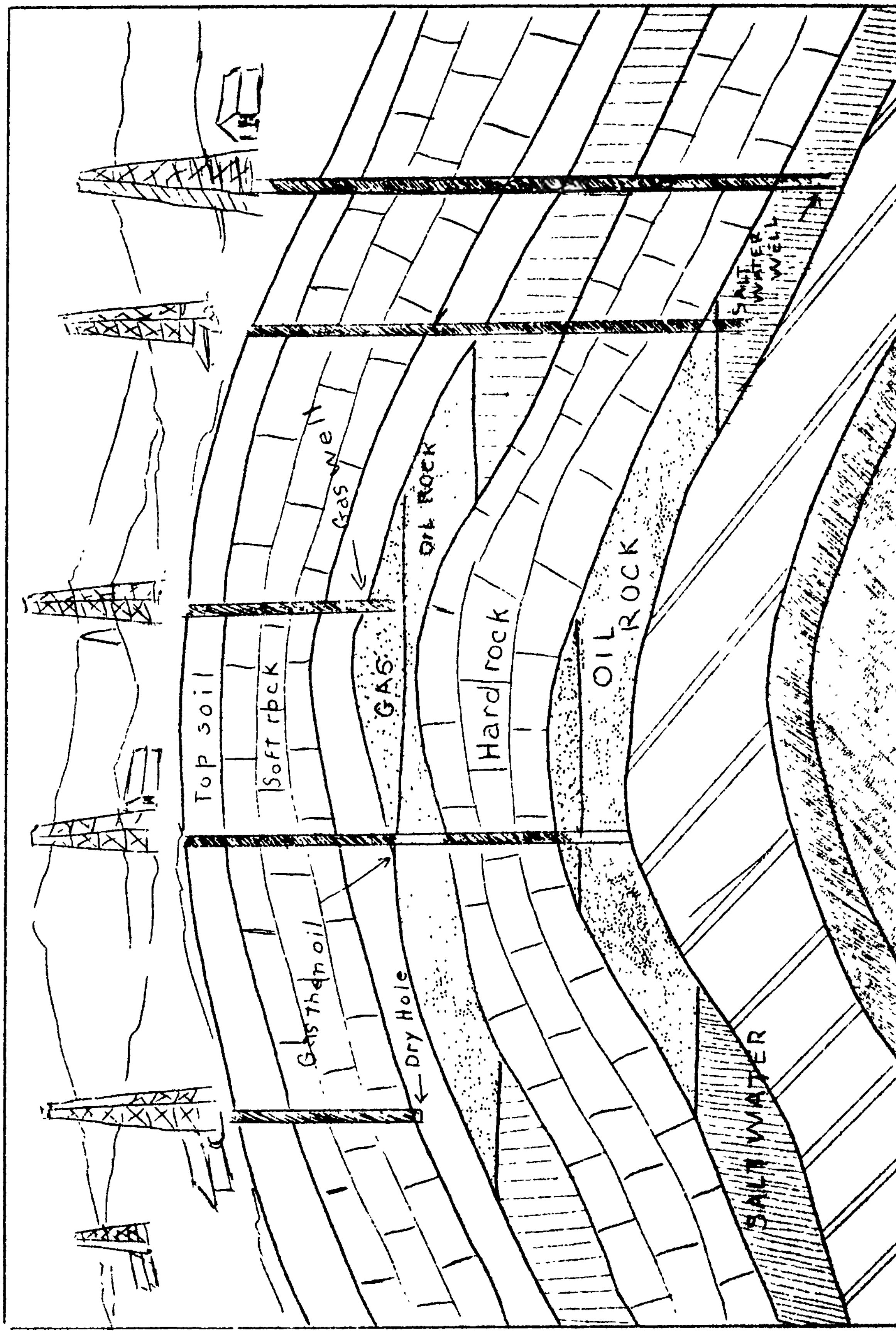
GRAPH OF

PETROLEUM PRODUCTS -- 1936.





The OIL INDUSTRY
Oilwell
Field Storage
Pipe Line to Refinery
Refinery Storage
This is a Refinery
Here oil becomes different products.
Gas
Oil
Water
Gasoline
Kerosene
Fuel Oils
Lubricating oils
Gas oil
Asphalt
Coke



SOIL FORMATION

THE FIRST OIL WELL IN AMERICA

In the early days in America only tallow candles and whale-oil lamps were used to give light. The whale oil which was used in these lamps was very difficult to get. It was obtained from the fat of the whale. Fishermen in sailing boats went on long dangerous voyages to find these great animals of the sea, to kill them, and bring back oil.

After a while it was discovered that the oil which was taken from the surface of certain pools of water and used as a medicine would burn and give light, just as the whale oil did. This oil, or petroleum, was much easier to get than the whale oil.

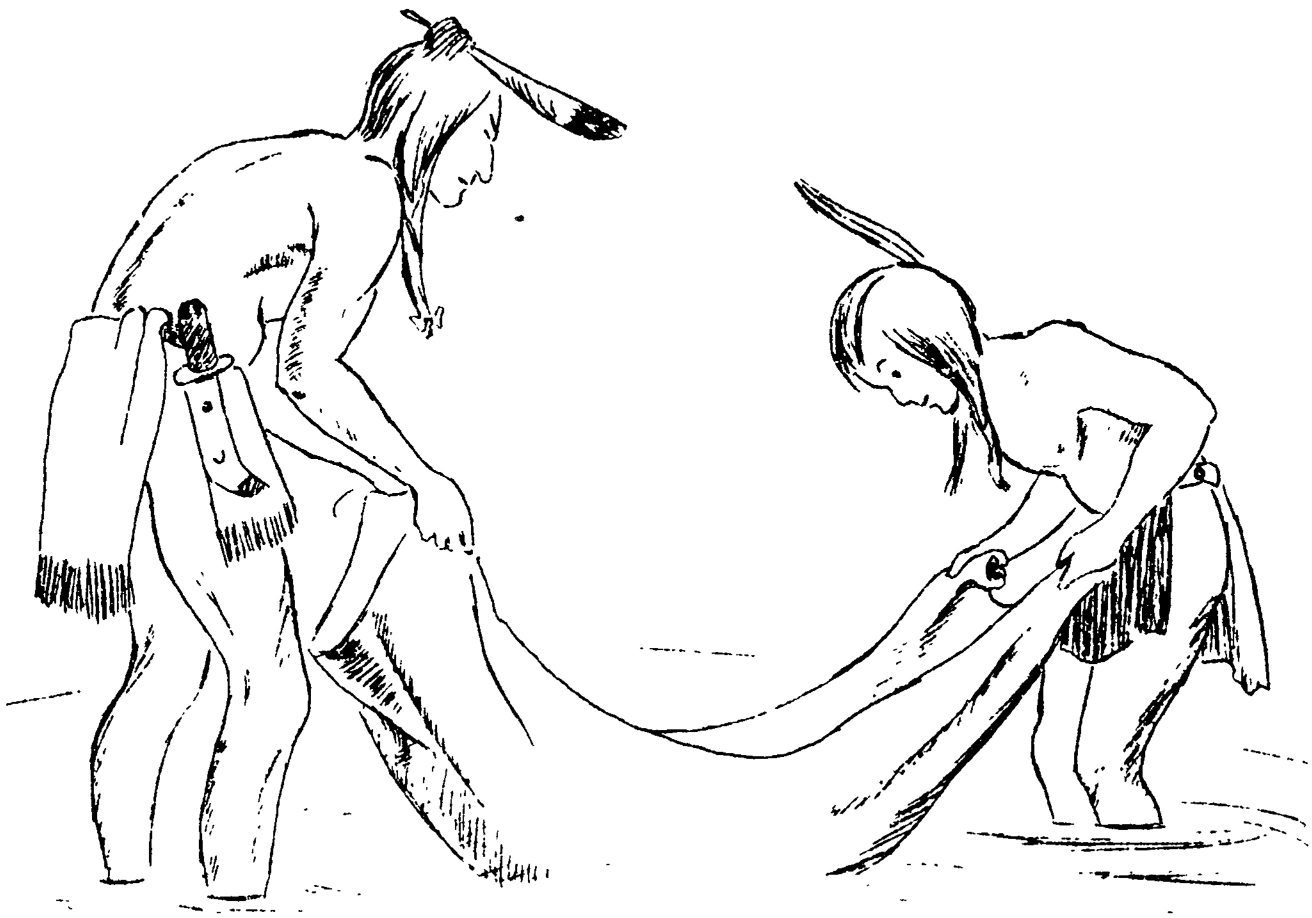
In order to get more petroleum for burning in lamps, there was a man who decided to drill in the ground for oil just as they drill for salt. He knew that in some of the salt wells oil had been found mixed with salt water.

A railway conductor, whose name was Drake, had charge of this search for oil. In 1859 in Titusville, a little village in Pennsylvania, a well was started.

Uncle Billy Smith who had drilled many salt wells began to drill the well. His two sons helped him, but it was hard, slow work. People in the neighborhood watched the drilling and laughed at Uncle Billy. The well was called "Drake's Folly". But Colonel Drake and Uncle Billy did not give up.

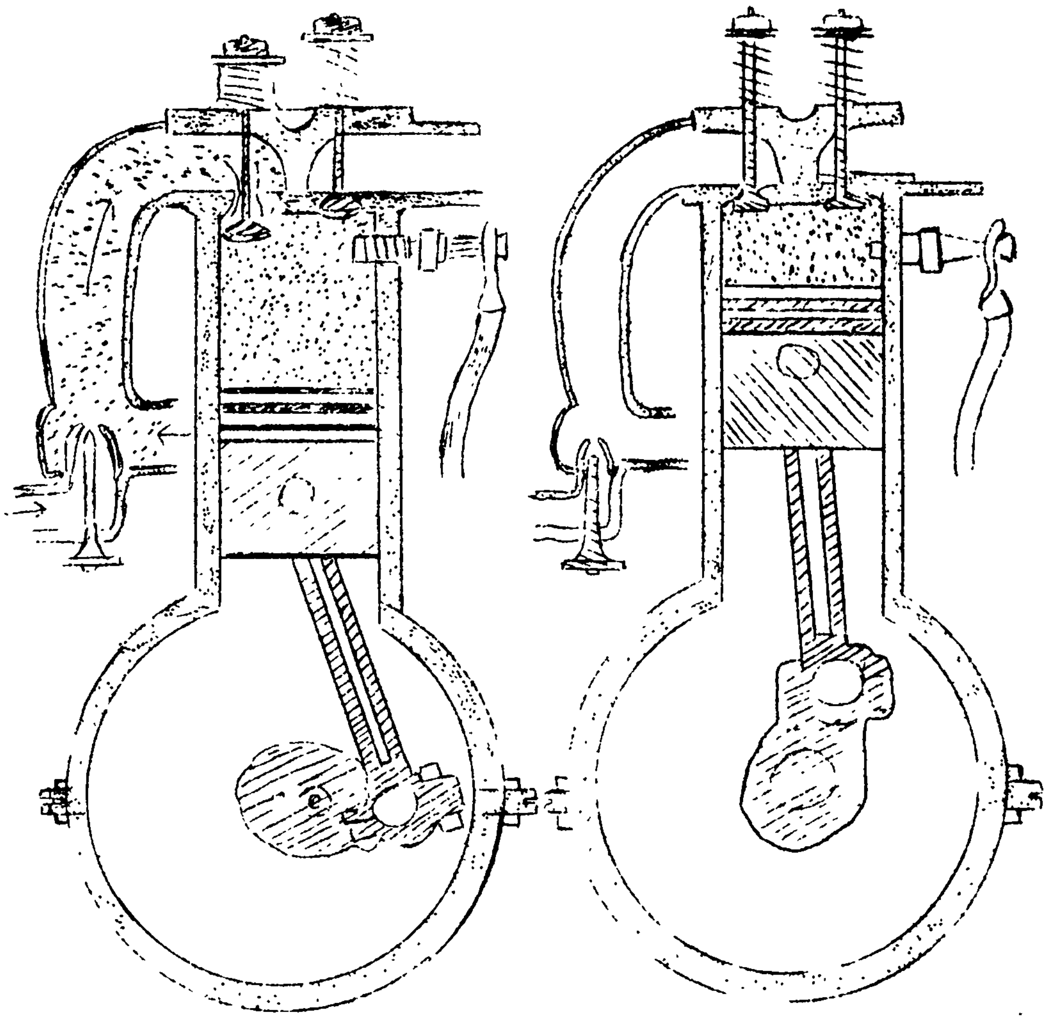
The hard work of drilling down into the rock went on through June, July, and August. At last one day when the well was sixty-nine and a half feet deep, a black oily liquid gurgled and almost filled the well. Colonel Drake and Uncle Billy had struck oil.

There was great excitement, and the men who had laughed began to drill wells themselves. In this way a great oil boom was started in Pennsylvania. People flocked there from far and near. Great quantities of oil were pumped out of the earth, and cities grew up around the oil field.



OIL IN EARLY DAYS IN NORTH AMERICA.

USES OF OIL.



Gasoline and Oil for Automobiles.

The automobile is the greatest user of gasoline and lubricating oil today. Thirty-five million automobiles of U.S.A. use about seventeen billion gallons of gasoline each year.

Automobile engines need a fuel that explodes quickly. Gasoline does this if it is mixed with air and turned into a vapor.

The carburetor of the automobile mixes the gasoline with air. The first cylinder in the diagram shows the piston going down. This is called the intake stroke because it pulls the gasoline vapor into

the explosion chamber. The intake valve at the top of the cylinder is open to let the vapor pass into the explosion chamber. The other valve is closed so that the vapor will not escape into the exhaust pipe before it is exploded.

The second cylinder in the diagram shows the piston going up. Both valves are closed so that the explosive mixture can be compressed into a much smaller space. If the mixture is under pressure when exploded, the force of the explosion is much greater. This gives the engine more power.

An electric spark jumping across the two points of the spark plug, causes the gas to explode. The explosion forces the piston down, but it comes right up after the explosion. As the pistons go up and down, the rods go up and down with them. The moving rods turn the crank shalf. The crank shaft of the engine is connected to a drive shaft under the floor of the car. The drive shaft turns the wheels whem the automobile is in gear.

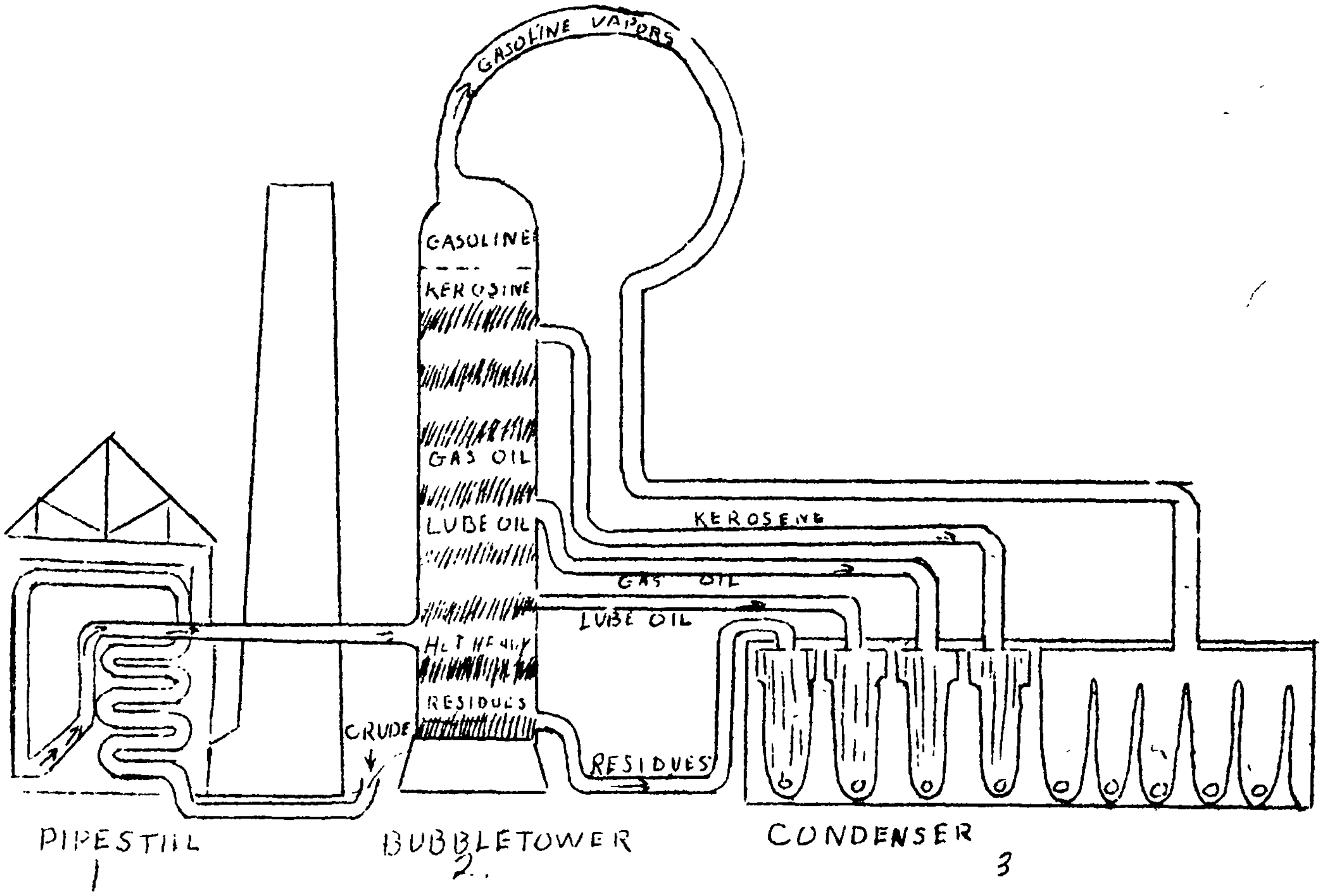
The moving parts of the automobile engine rub against each other. This friction causes heat. Lubricating oil is needed to cut down friction, for the moving parts would melt without oil. The quart of oil your dad ordered protects the moving parts.

FIRE IN THE OIL FIELDS

Sometimes oil is struck before the drillers expect it. The well may go wild. Then a black fountain of oil spouts high into the air. The oil may catch on fire as it blows in. A spark from the flames under the steam boiler may change it into a cloud of fire and smoke. Sometimes it is a spark of frictional electricity from the engine belt that changes oil into a funnel of flame.

Oil well fires are difficult to fight. The fighters wear asbestos suits and gas masks for protection. They spray large jets of steam over the mouth of the well. The steam spreads a blanket over the flames and puts them out. You know that fire must have oxygen to burn. The steam cuts off the oxygen supply and then the fire goes out. Sometimes it takes many days to put out oil fires.

Oil well fires may do a great deal of damage. They may destroy wells and buildings in the oil fields. Thousands of gallons of oil may be burned. We no longer have as many fires as we once had, because oil men have learned how to prevent gushers from shooting into the air.



REFINING OF OIL.

The petroleum which men have obtained from the earth is not useful in its natural state. Man has used his ingenuity to derive a method to separate the different parts of this into forms which are useable. The process is called the refining of oil.

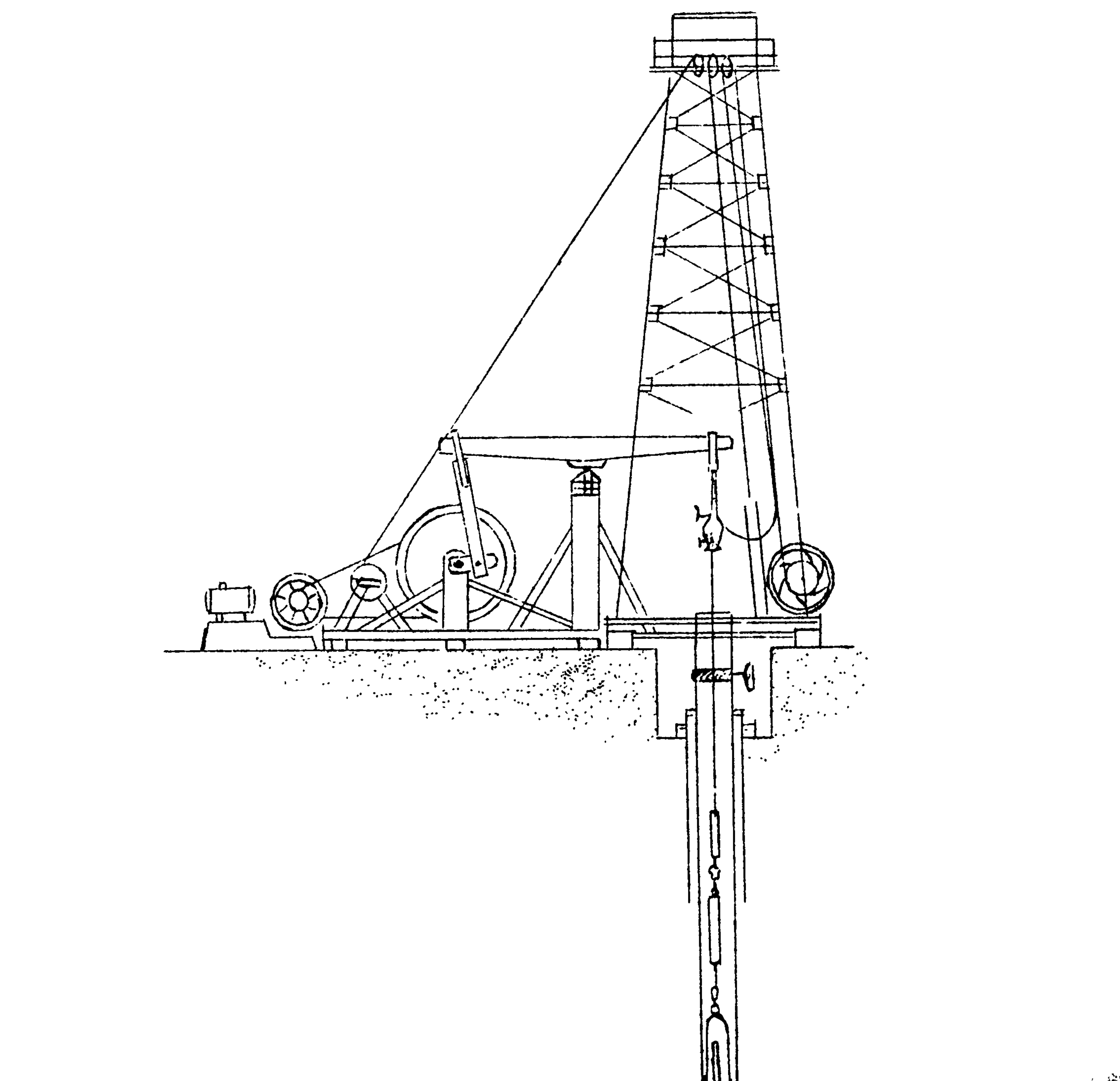
The method of refining is called "Simple Distillation". Take a solution of salt water and heat it. You will see steam rising. Then put a cold glass in the steam. Bubbles of moisture will collect on the glass. The salt will remain on the dish. This is a simple illustration of separating the salt and water by means of "Simple Distillation".

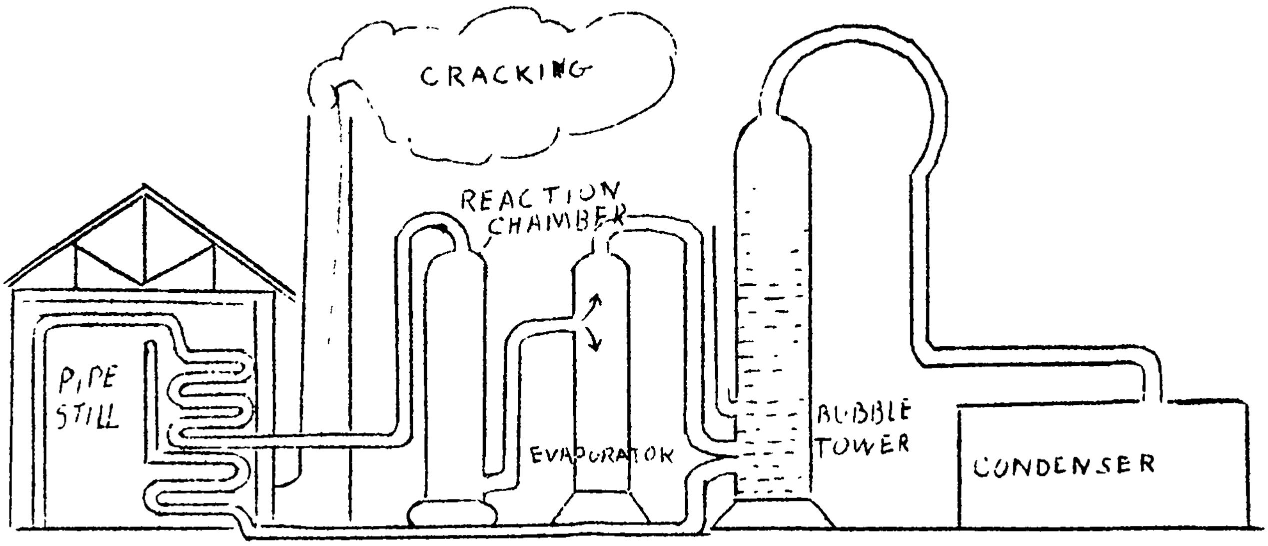
The refining of petroleum uses this same method. The petroleum

is piped into the Pipe Still where it is heated. The heat causes it to become vaporized and rise. Some remains as a liquid. The vapor is then passed into the Bubble Tower where there are various sections heated to different temperatures. The hot heavy residues condense at the bottom. The lubricating oil condenses next followed by the gas, oil and kerosene. The gasoline remains a vapor. These are then led into separate compartments where they are further condensed.

Next they go through a cleaning process before they are ready for use.

The companies must frequently test their product to make certain that it is the same and contains no impurities. We would not want to buy gasoline which differed each time we purchased it.





CRACKING OF OIL.

The refining of oil meant separating the petroleum into its component parts. The cracking of oil is a method by which oil, which has already been simply distilled, is "cracked" into still more parts, just as a big stone can be broken up into tiny pieces by smashing it with a "sledge hammer" of pressure and heat. Something NEW is created.

GAS OIL, the third heaviest portion of the crude, when heated to a very high temperature under pressure will separate into several parts, or fractions forming Gasoline with small additional portions of gas, fuel oil, tar and coke.

1. Gas. Oil goes to the Bubble Tower, then is heated in a Pipe Still.
2. Hot Oil goes to the Reaction Chamber, where, still under pressure, the oil is broken up into gasoline, gas and heavy tar by chemical reaction.
3. The newly created products move on to the Evaporator where the tar separates out and falls to the bottom, while the gasoline goes out of the top of the tower, together with the gas to the Bubble tower.
4. From this point the process is similar to Simple Distillation.

OIL FIELDS OF TODAY

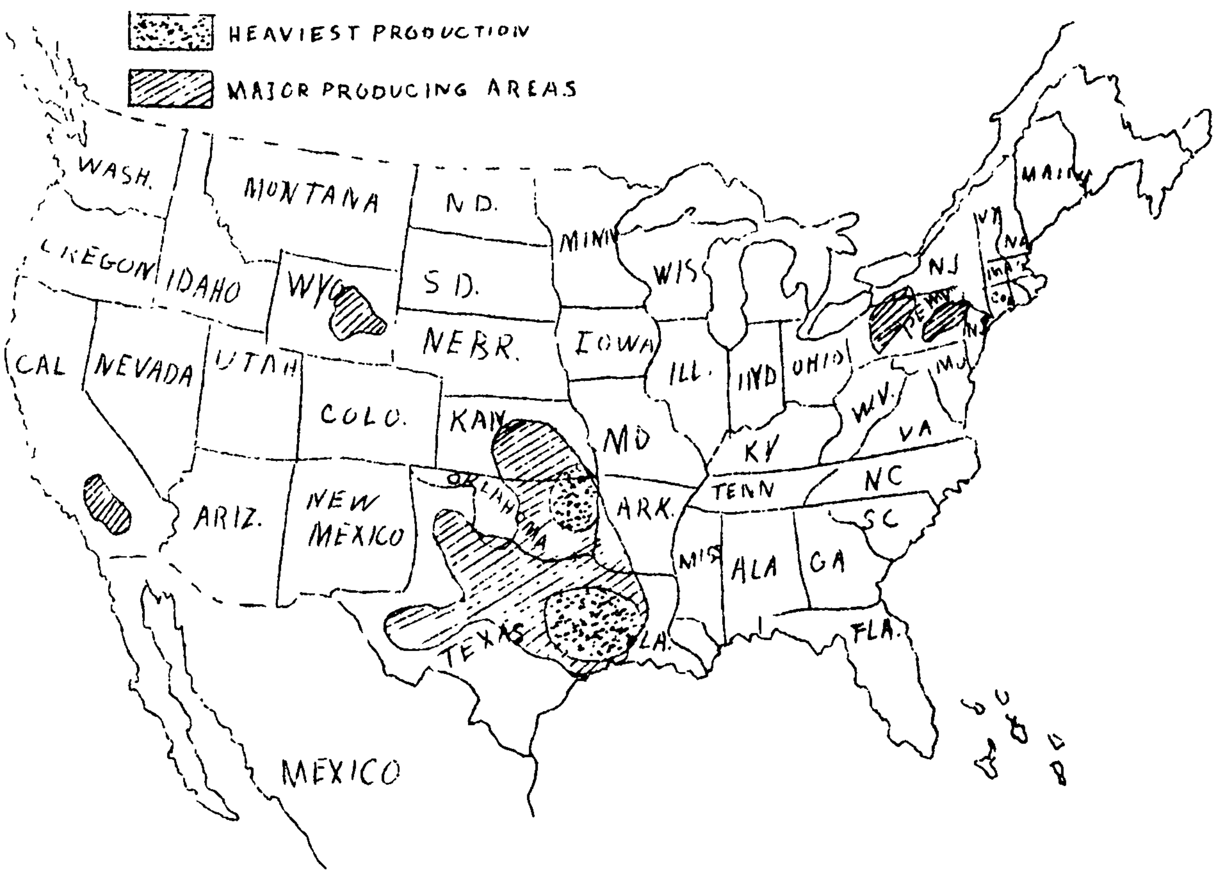
A product as essential to the life of the people of the world as oil would be looked for in many places, Oil has been found in many different countries.

United States leads the world in oil production. Texas, Oklahoma, Arkansas, Kansas, Wyoming, Pennsylvania, Louisiana, California being the states with the greatest supply.

South America is recognized as one of the world's greatest oil continents. Peru is the oldest producing country, and Venezuela is one of the greatest importance at present. In recent years Russia has become the second oil-producing country in the world.

Among the countries which produce oil are Mexico, Persia, Rumania, the East Indies, and Canada.

Turner Valley, Alberta is a great natural oil field of Canada. In northern Alberta at Fouce Coupe they are also drilling for oil. To a smaller extent oil is found in Lambyen County, Ontario.



OIL IN U.S.A.

TURNER VALLEY

Oil was discovered in Turner Valley just before the First Great War and for the next few years several wells were drilled but no great success was achieved in securing real producers. In 1924 Royalite No. 4 came roaring into production and an oil boom followed. There was a great quantity of natural gas in the production of these wells, some of it was piped to Calgary, some was pumped into the wells at Bow Island and the largest part was burned. The flares from Turner Valley could be seen for many miles.

Another oil boom took place in 1936 when oil was struck on the west side of the field. This time better methods of production insured less loss in pressure. Production quotas were placed on the wells.

After the great drain on the Valley during the war years it was found that the peak production had been reached and all future production would be on the downward scale. Oil men began to look elsewhere for oil. To-day Turner Valley seems to be forgotten as the oil conscious world shows such an interest in the new fields which are being discovered so quickly. We must admit that the output of Turner Valley is shrinking but in 1948 it still produced 40% of Alberta's Oil.

OTHER OIL FIELDS IN ALBERTA

1. Leduc

In February 1947 the Leduc Field "Kicked in". Since that time it has been extended in all directions and shows signs of becoming a very good rival to Turner Valley. In June, 1948, the monthly production of the Leduc field became greater than that of Turner Valley.

Geologists had expected the wildcat well, Leduc No. 1, to become a real producer so were fairly well prepared for "big things" from Leduc. Soon after the first well became a producer other wells began to strike oil.

Leduc became a hive of activity as workers streamed into the new field. A new townsite, Devon, was set aside. It was soon a complete community of prefabricated buildings. Pipelines were constructed to Nisku, a railway siding almost 9 miles distant, and the oil was sent to Edmonton for refining. A pipeline has now been constructed to Edmonton where the process of refining takes place. Some oil concerns are interested in constructing pipelines to the Pacific Coast or to the "Head of the Lakes".

The whole countryside around Leduc has changed in the past two years. It was a quiet farming community, now it is dotted with derricks, huge trucks travel back and forth over

Leduc (contd.)

its roads, and many farmers have more money than they ever expected to see.

2. Redwater

The discovery well of the Redwater field was completed in September 1948. The thickness of the producing zone of the Redwater field is about four times that of the Leduc field. Only time will tell whether this field will live up to the expectations oil men now have for it.

3. Lloydminster

The third field in production in 1948 was Lloydminster on the Alberta-Saskatchewan boundary. It is an old field but it has taken a considerable jump in production of recent years. The oil from this field is of a heavier grade than that of the other fields and makes excellent fuel for oil burning locomotives.

4. Lesser Fields

In addition to the above oil fields there are several fields producing varying amounts of oil. Included in this list we find: Princess, Taber, Conrad, Vermilion, Wainwright, Del Bonita, Twin River, Jumping Pound, Dina, Armena, Brooks, and Pincher Creek. The list is growing day by day.

TRANSPORTATION OF OIL IN TURNER VALLEY PAST AND PRESENT

Twenty years ago oil transportation from Turner Valley differed greatly from the method of transportation in use today. Four horse-teams hauling oil in drums was the first method used. The distance from Turner Valley to Okotoks, a railroad shipping point is approximately seventeen miles. One team had headquarters in Turner Valley the other in Okotoks. Daily, except Sunday, the team from Okotoks would draw a load of empty drums to the "Half Way", about 9 miles out, returning the same day with a full load of oil. This oil had been transported to the "Half Way" point by teams from Turner Valley. These teams returned with the empty drums which had left Okotoks that morning.

Progress in transportation led to the use of trucks to haul the drums. Soon the drums were supplanted by a single tank approximately ten feet long and five feet in diameter set on the body of the truck. Invariably a length of chain hung from the tank to the ground, its purpose being that of a conveyor of static electricity from the tank to the ground. Sometimes in spite of this precaution tanks exploded, and load and truck would be a total loss. Incidentally the tank trucks to be seen on the roads today are built in compartments which eliminates much of the danger from explosion.

As the volume of oil to be transported increased it became necessary to lay a pipeline as a conveyor.

The first pipeline, a four inch, was laid from Turner Valley to Calgary in 1925. Today there are two more, a four, and a six inch. A pipeline system consists of gathering lines and truck lines very similar to the blood system of the body. The gathering lines take the oil from the various wells into a main gathering line thence to a central station or tank farm, from which the oil is pumped through main trunk lines to its final destination. Oil is produced at a well and stored in tanks on the location. Tanks of five hundred, thousand and two thousand barrel capacity may be used for this storage. The pipeline department then takes charge of the oil.

A gauger goes to the location and through a hole in the top of the tank drops a steel tape, marked in feet, inches and fractions of inches. On the end of the tape is a "bob" or weight to which is attached a thermometer. The Surface of the oil shows as mark on the tape and from that mark to the bottom of the "bob" is the depth of the oil. The gauger then marks on a run ticket, similar to a store bill, the measurement and temperature, of the oil in the tank. The next step is the sealing of the tank, this is to prevent any sabotage on the part of marauders. The gauger fastens a wire around the handle of the tap at the bottom of the tank, in such a manner that the tap could not be opened without breaking the wire. Should the wire be broken when the gauger returns to secure the bottom measurement, the whole shipment is void. After sealing the tank a pump driven by gas pressure or steam, is started and the oil from the tank at the well is driven down the lateral gathering line to the main gathering line where it joins other oil being pumped from other wells to the main or central station. When the tank is pumped out, again the oil is measured in a similar manner as that used before pumping. The gauger records this measurement and the temperature on the run ticket. The difference between the first and second measurements gives the number of feet and inches of oil that was in the tank. Later by the use of tables this measurement is recorded on the run ticket in barrels equivalent. These barrels are then corrected for temperature at 60 degrees Fahrenheit, the amount increasing or decreasing inversely with the temperature.

From the main station, where the oil is stored on receipt from the field, it is pumped through trunk lines to the Refinery in Calgary; careful check being kept on the barrels pumped and barrels received.

A rather interesting fact about the oil pumped through a line is loss. The amount pumped is never received, and this is not due to leaking lines or tanks. The nearest explanation is that loss is due to friction and vaporization. All tanks are equipped with "breathers", openings in the top through which air passes in and out. When oil runs into such a tank the swirling around releases some oil in vapour form which escapes into the air. Friction produced between the oil running in a line and the side of the pipe, has also a tendency to heat and vaporize the oil which escapes when the oil runs into a tank.

The manner in which a pipeline is laid is a story in itself. The engineering department of the Pipeline Company first surveys the desired route for the line. Pipe, blocking, ditching machines; pipe-laying machines, welding, carts, oxygen and acetylene bottles, tools, boxes, wagons, tar-pot, trucks and men then arrive on the scene.

Trucks string the pipe along the right of way dropping each length of 30' each end to end as they proceed. Blocking, that is timbers ranging from eight feet to four feet in length and from ten inches to four inches in thickness are then dropped along the route. A gang of men called "liners" proceed to line the pipe. This procedure consists of setting the pipe upon blocking with the ends of the pipe nearly touching, and perfectly level. Such work is quite exacting because of the unevenness of the load. Following closely behind come the welders, each having a helper, whose duties consist of helping pull a welding cart on which the Oxygen and Acetylene bottles rest, and relining pipe when necessary. When a weld is completed it is stamped with a number, so as to determine the welder should the weld be faulty.

Gradually the line becomes whole and winds over the country like a snake, the pipe always taking the contour of the surface, bending down into dips and bowing up over hill-tops.

Somewhere on the line comes the ditching machine digging a ditch usually forty-two inches in depth. This machine weighing fifteen ton crawls along making a ditch a mile and a half long in a day under good conditions. Such a length of ditch would necessitate the employing of about fifty men to do the work in a day if pick and shovel were used.

As the pipe is welded, it is tested in sections for leaks. A section of completed line anywhere from one to five miles in length is filled with gas or compressed air provided by a portable compressor A pressure of perhaps two hundred pounds per square inch is set up within the line. Any leak would be quite easily found because of the noise of the gas or air escaping. When a leak is found it must be repaired before the pipe is conditioned. The gas or air compressed in the line on being released cleans out all debris which may have got into the pipe during the different operations up until the line was a complete section.

As the ditch is made a crew of men known as the tar-gang follow behind, conditioning the pipe and lowering it into the ground. To condition pipe it is necessary to have the long joined string set over the open ditch on blocking. The first step is the cleaning of the pipe. Mud, rust or grease must be scraped off and the pipe cleaned with kerosene before the hot tar will stick to the pipe. Following this is the first tarring or painting. Under the pipe and held at both ends by two men is placed a piece of canvas, usually three or four feet wide by ten or twelve feet long. This canvas has the name of the "Granny Rag". Nearby is the tar-pot equipped with a fire-box and a receptacle for holding tar. From this receptacle, lead spouts, with taps through which the boiling tar can be drawn as needed.

One man known as the "Pourer", with a "watering-can-like" pail proceeds to pour hot tar on top of the pipe directly above the "granny-rag". The men on the "granny-rag" pull back and forth under the pipe spreading the tar on the bottom of the pipe as the "pourer" does on the top. Men carry steaming pails of tar to the pourer continually, and progress can be made at a good rate. When the men on the canvas come to a place where the pipe is resting on the blocking the pipe is pried up with a "pry-pole", from the blocking then lowered again after the part resting on the block has been tarred. In cases where heavy pipe is used a caterpillar pipelayer does all pipe lifting that is necessary. Following this the pipe is wrapped with burlap. Every square inch being covered. Again follows another tarring done in the manner as described before, but this time the burlap is tarred while first time the pipe got the coating.

This completes the conditioning of the pipe. It is now lowered carefully into the ditch to prevent breaking in places where there is too much pipe for the ditch. The line is lowered only in part, "loops" of pipe being left suspended over blocking. The increase in length of the line is due to expansion from the heat of the sun. In the evening when the pipe has had a chance to contract these loops are lowered quite easily and the pipe lies in the bottom of the ditch.

To cover the pipe both hand labor and machine labor is used. In places where sloughs are crossed the ditch is backfilled by hand, but wherever possible a caterpillar tractor pulling an ordinary road grading machine proves very successful at pushing the earth back into the ditch.

THE CONQUEST OF ATLANTIC NO. 3

-- Imperial Oil Review, January, 1949.

The bright skies of a sunny Labor Day were beginning to fade as evening approached and many Edmonton people were about to begin supper after a pleasant holiday. Suddenly a column of billowing black and white smoke with flame at its base sprang up on the southern horizon. Word spread through the oil-wise city that "Atlantic's on fire!"

The giant pillar of smoke remained over the Leduc oil field for almost two-and-a-half days. At times it resembled the huge mushroom in the sky that follows an atomic bomb explosion. Gradually it dwindled to steamy wisps and then disappeared. The fire at the wild Atlantic well had been killed by the stubborn efforts of oil men.

Atlantic No. 3 well gave Canada its most unusual and in many respects most spectacular fire of 1948, burning an estimated $50,000 worth of oil a day.

On the evening of the outbreak the flames could be seen from 16 miles away, and the neighboring highways became choked with automobiles as thousands drove out to take a closer look at the spectacle. Radio commentators filled the air with their descriptions of the blaze and newspapers across Canada rushed pictures and stories into print.

The fire directed more attention to the oil fields of Alberta than any other recent development. People who had read about, but not paid much attention to the discovery of a 200,000,000 barrel field at Leduc now said: "That's a big fire. It must be a big oil field", and as one observer remarked, "The fire certainly put Alberta oil on the map."

However in spite of all the newspaper, magazine and radio stories, one mistaken belief remains fairly common. It is that the wild Atlantic well belonged to Imperial Oil Ltd.

Atlantic No. 3 belongs to the Atlantic Oil Co. It does not belong to Imperial Oil.

The mistaken belief may arise because Imperial's name is so closely associated with Leduc. Many people do not realize that although Imperial discovered the field there are 38 other companies -- of which the Atlantic Oil Co. is one -- now active at Leduc.

Imperial's association with Atlantic No. 3 was simply a case of lending a helping hand at the request of the Alberta Petroleum and Natural Gas Conservation Board. The Company lent men and equipment to help fight the long battle that finally brought the wild well under control.

The fire is only the middle of Atlantic's colorful story. The flames broke out when oil men had success almost within their grasp after months of driving, round-the-clock work to kill the wild well. The beginning was in March when the well blew out of control; and the end did not come until November when cement finally concluded Atlantic' turbulent career.

The well was on the John Rebus farm, one mile northeast of the Leduc discovery well. The Atlantic Company began drilling there in mid-January and the new well came in on March 8th as a gusher, out of control and spraying gas-driven oil.

Gushers are a rarity today because of modern drilling methods that control the pressures which help bring oil to the earth's surface and so help to conserve oil reserves. Just what happened to Atlantic No. 3 is still a matter of conjecture but the effects were spectacular right from the beginning. The well spouted some 10,000 barrels of oil and 50 million cubic feet of natural gas in a great dirty brown column reaching 150 feet in the air. The snow-covered fields were splattered with an oil-film over a wide area around the well head; the ground shook and from the well came a steady, high-pitched roar.

Atlantic was on the rampage.

The drillers began the attempt to control the well by pumping heavy mud down the hole to choke the flow of oil. Several hundred tons of mud went down and after 38 hours the flow was shut off. Atlantic was under control at least temporarily. Large volumes of mud, cement and other materials were pumped down the well in an endeavour to "kill" the pressure of t he gas in the hole. But these efforts were not successful and a new trouble soon developed. The high pressure in the formation 5,267 feet below forced gas through the fissured rock and up to the surface at several points around the well. By early May surface craters had multiplied from a few to hundreds. Oil began to gather in pools over a 40-acre area. Oil workers drove themselves day and night in the attempt to check the outburst and the Alberta Conservation Board brought in Myron M. Kinley, an expert on fires and blowouts in oil wells, from Texas to direct the battle.

In the next weeks concentrated attempts were made to kill No. 3 by working through the original well head. It was planned to set off explosives 2,000 or 3,000 feet below ground that would cave in the hole and seal it but this was unsuccessful because of the plugged drill pipe. A mixture of feathers, sawdust, cottonseed hulls, redwood shavings, mud and 10,000 bags of cement was pumped down without any results. The well devoured everything the drillers fed it but the fodder vanished without a trace.

By May 7th the wild well was affecting the operations of the entire Leduc field. The oil flowing through hundreds of craters in a 10-acre area mounted as high as 15,000 barrels a day. Most Leduc wells voluntarily closed down so that the Imperial Pipe Line Co. line to Nisku could be used to carry off the oil being salvaged from sumps and pits around Atlantic.

Five days later it was estimated that the earthen dikes around the well were holding 75,000 barrels of oil, spread over 40 acres. The 10 acres west and north of Atlantic were a green-black cauldron in which 20-to-50 foot geysers spouted oil, gas and mud.

The area became a public menace and on May 14th Ian McKinnon, Chairman of the Conservation Board, announced that the Alberta Government had taken over the Leduc field and formally ordered all 61 producing wells shut down to permit all the facilities of the pipe line to be used in removing the oil from the Atlantic pits.

The wild well was producing great volumes of natural gas, estimated at 50 million to 100 million cubic feet a day and aircraft were forbidden to fly over Leduc lest the gas be ignited. The oil lake was a definite fire hazard and a four-square mile area was barricaded and policed to keep the public from the danger zone.

W.G. "Whit" Sexton, head of the Imperial Pipe Line Co. was in action making full use of the Nisku line. The Canadian National and Canadian Pacific railways gave their co-operation and started all available tank cars rolling toward the railhead at Nisku.

The pipe line could pump 30,000 barrels a day to the railhead but loading facilities could handle only 7,800 barrels. Within a few days this was raised to 12,000 barrels and the oil lake began to drain.

Welding crews from all parts of the field worked on pipe lines joining Atlantic No. 3 sumps to Atlantic No. 1 and No. 2 producing wells Soon giant pumps were forcing some of the wild oil down through these two wells to the reservoir formation a mile below the surface. The pipe line handled the balance of the oil and tank cars moved it to refineries all over the west.

Meanwhile the Conservation Board asked Imperial for the services of Vincent J. "Tip" Moroney, operations manager for the Company's western producing department, so that he could direct the fight against the rogue well.

Because the attempts to plug the well from the surface proved unsuccessful it was decided to drill two directional relief wells -- one 700 feet south and one 700 feet west of Atlantic No. 3. The relief wells would bore in to meet the original hole close to the producing area and then materials could be pumped down the relief shafts to choke off Atlantic's oil at the source. It was realized, of course, that drilling of the relief wells would take months of hard work.

By June 5 most of the oil which had accumulated in the pits around the well had been pumped away. The Conservation Board, therefore, permitted the other Leduc wells to resume limited operation. But the unpredictable rogue immediately began to pour out more than 10,000 barrels a day once more. It became evident that well head attempts at control were futile and another experiment was then planned.

A quarter of a mile west of Atlantic No. 3 lay Imperial Leduc No. 48 well, completed but shut down because of the emergency. Moroney rigged up pipe lines from the North Saskatchewan river, one-and-a-half miles distant, and began pumping vast quantities of water down No. 48. He hoped it would flood the formation and kill off the wild well. In less than three weeks more than 691,000 barrels of water were forced

in -- without result.

So Tip Moroney, who carried a sleeping bag in his car and often considered he was lucky if he found time to use it, turned all his attention to the two relief wells. He had full authority from Imperial to use any Company men or facilities he needed and he recruited a group of key men. Among them was Charlie Visser, Imperial's drilling superintendent who is considered to be one of the best drillers in Canada. Other companies co-operated fully, contributing personnel, equipment and advice.

The two relief wells were to be drilled straight down for a considerable distance and then gradually deflected to the angle which would reach the area where Atlantic No. 3 entered the producing formation.

It was no simple task. In theory, a well goes straight down. In practice, most of them wander off at a slight angle so that No. 3 might be bottomed anywhere in a 25 to 50-foot radius under the well head plumb-line. And this would be a mile down in the earth.

From data obtained from surrounding wells, Moroney calculated that the bottom of the wild well might be far down under a point a few feet northeast of the well head. So accurate were his predictions that four months later the west relief well finished directly under Atlantic's well head and the south relief well actually drilled into the Atlantic hole just 20 feet above the producing formation.

Oil men say that directional drilling is three times as difficult as the usual drilling. Trouble comes about three times as often: the pipe parts; drills get stuck; mud problems develop. To obtain the desired deflection the hole is directed by a device known as a whipstock, a steel tool shaped like a long half cylinder, which guides the drilling bit. Drilling is slow because each foot of depth must be carefully surveyed to be sure that the hole is going in the right direction.

Drilling of the relief wells continued through the summer. With success almost in sight, the south well ran into trouble and had to be re-drilled. The west well, too, came in for some re-drilling. By the end of August it was completed in hard green shale just above the producing formation. In an endeavour to break through to the Atlantic No. 3 hole, surface pressures of 3,000 pounds to the square inch were exerted but they failed to break through the shale even after several days of water injection.

Meanwhile the fire hazard at Atlantic remained as a constant threat which merely varied in degree as the work proceeded. When the well first went wild all electric lights on the job were cut off because a stray pebble might smash a bulb and start a fire. As the months went by the lake of oil was reduced in size as the pipe line drained it off but the area remained a danger zone all through the summer.

The boilers needed for drilling the two relief wells caused continuous anxiety. Wind socks were set up all around the field and when they warned that gas or oil spray might be blown in the direction of either drilling rig, the boiler fires were cut immediately.

However, when week after week went by without an outbreak, the possibilities of a fire at Atlantic began to be forgotten by the public and by everyone except the men working in the restricted area. It is ironic, but very fortunate, that the fire when it did break out came just as the relief wells were almost ready to do their job. It was as if Atlantic No. 3 knew its days were numbered and through sheer cussedness decided to stage one last mighty act of defiance.

All through the summer the No. 3 derrick and drilling rig had stood quietly in the field. The equipment was ringed with craters but most of them were at a distance.

In the first week of September Atlantic No. 3 answered the west well's challenge. Craters began to break out close to the original well head. The derrick shook as cratering increased. Great chunks of rock shot into the air accompanied by escaping oil and gas. For several days no workers were permitted near the derrick. Then the tall steel structure, undermined, started to lean southward. If it fell into the churning crater, a flying rock might hit the metal, strike a spark and touch off a great fire.

A crew of 12 men was sent in. They jacked up the derrick, working at top speed, and then got out as fast as they could.

Within an hour the 136-foot derrick was tipping again -- to the north this time. It toppled at 1 a.m. on Labor Day morning and by daylight all of it had disappeared in the crater except for a few feet of jagged metal broken off from the upper part.

The well continued its volcanic action, building up a mound 15 feet high around the main crater. The same morning the drillers deepened the west well to connect it directly with the producing formation. Water injections were started immediately and then later the well was acidized to "open up" the formation and thus increase the rate of water injection.

At quarter past six that evening, Charlie Smith and L.H. "Hick" Kern, directional drilling experts from Texas, were about 100 feet away from the well when Kern suddenly yelled: "Look!"

In that instant a ball of fire had appeared over the derrick floor, danced briefly, then skipped down into the main crater. With a great, sighing "Whoosh" the escaping gas and oil caught fire. There was no sudden explosion but the flames roared 400 to 800 feet into the sky and the column of smoke mushroomed up and up until it flattened off at 7,000 feet to send a tremendous trailing plume eastward over the plains for a hundred miles.

Atlantic was on fire. After months of anxiety, and careful precautions, a spark had jumped from somewhere. Perhaps it was shale striking the collapsed metal derrick; perhaps it came from rock striking rock or even from the pressures rubbing metal upon metal in the crater. But no one had been killed or injured -- Smith and Kern had had time to take to their heels and escape. The worst hadn't happened.

"Well, at least we can smoke now," a tired roughneck said, as the $50,000-a-day fire roared.

Flames licked out to ignite the oil sumps and in twenty minutes the whole 40 acre area was ablaze. A lone bulldozer had moved swiftly to close the eastern entrance to the largest oil sump to the northwest and saved several thousand barrels of oil. The rest went up in smoke.

The flames burned over the oil-soaked earth as thousands of gas-fed flares dotted the area around the orange-black centre tower of flame and smoke. A battery of 12 bulldozers threw up a fire-guard around the well site, inching closer as oil burned out of the earth. Two bulldozers moved nearer the inferno to squeeze the burning gas jets into a 10-acre sector.

But the fire really was fought from the west relief well. More acid was pumped into the hole to permit an increase in the amount of water injection. Then the water pumps took over again forcing 1,500

barrels an hour into the depths to swamp the fire at its source.

Tip Moroney and the others, some of whom went without sleep until the fire had eased, won the long battle with Atlantic No. 3, less than 60 hours after the blaze broke out.

The black smoke showed tinges of grey as steam appeared where oil and gas had gushed. That was on Wednesday afternoon. Early next morning the well gave forth three last great belches of flame; sputtered, and died.

A few days later the south relief well completed drilling, and the crews began the long and difficult job of cementing the wild well to close it off forever. This was not completed until November 15 -- a difficult task, done without fanfare and with little recognition, for most Canadians believed that the well had been killed off completely when the fire was extinguished.

In its wild career Atlantic No. 3 produced an estimated 1,250,000 barrels of oil, but most of it was recovered from the pits or pumped back into the formation. The loss in natural gas can only be guessed, but it is believed that between 50 and 100 million cubic feet daily escaped into the air. The lowest of these figures would give a total of approximately seven billion cubic feet during the time the well was uncontrolled.

In six months and a day Atlantic No. 3 became the second greatest producing well Canada has yet had. The greatest is the nine-year-old Home Oil Millarville No. 2, at the north end of Turner Valley, which gave up 1,485,000 barrels in the nine years and still is producing 4,000 barrels a month.

Besides publicizing the Leduc field, the wild well contributed valuable reservoir information to the production engineers. There was comparatively little loss of oil, no loss of life and the fire advertised the field as nothing less spectacular could have done.

These features helped to offset the damage done by the rampaging well -- but oil men who worked day and night for the long months needed to subdue Atlantic No. 3 don't want to see another rogue well as long as they live.

FORMATION OF AN OIL COMPANY AND DRILLING BY STANDARD EQUIPMENT

These topics are explained by Jack Dick, Director of the Phillips Petroleum Company. Mr. Dick commenced his struggle in life in 1903 at Emerson, Manitoba, that old winter retreat of the Selkird Settlers, but his recollections of the first five years are only vague.

His folks moved to Gould Town, Saskatchewan to a wheat farm. Jack received his education in a one-roomed public school there and at the High School at Herbert, Saskatchewan.

Dry years came and his father's wheat farm could no longer hold Jack. He spent the years 1922-23 as a hired man at Nanton and Gleichen Alberta, driving an eight-horse team, milking cows, and feeding pigs in the evening after the day in the field. Still this future director of an oil company was not satisfied. He attended a school of motor mechanics and later he took a course in steam engineering at the Technical School in Calgary.

1925 saw him in Southern California, broke and picking cotton in competition with Mexican labor. He made a stake, enough to take him

to Washington. Here we see him putting to practical use his course in steam engineering. He fired a donkey engine in the lumber camps. He came back to Alberta in 1926, firing for drilling crews on various wells, and later tool dressing. He worked for the Model Oil Company in the north end of Turner Valley. This company struck the first crude oil in the west flank. A faith in the west flank structure grew in his mind, he formed a friendship with a driller J. Philips, they both had the same vision. They would pool their resources and drill a well themselves; they did, but not without meeting almost insurmountable obstacles.

Now go ahead with Jack's explanation...

The Struggles of an Independent Oil Company.

I have been asked to relate how the Phillips Petroleum Ltd. was organized by two working boys. Although our project is four years old, the romance of the venture is still deeply covered with serious business and uncertainties, and whether our venture should turn out well, or otherwise is yet to be seen. With time I hope the romance will emerge and allow us to participate in the ludicrous as well as the solemn.

My first acquaintance with Mr. Phillips was when in 1929, I went to work as a tool-dresser for Parsons, Phillips, and Enoch, three drillers who were drilling under contract, Anaconda No. 1 Well. This well by the way was taken over by the Model Oils Ltd., in 1932.

My business associations with "Red", started, when, in 1933, we decided to obtain a block of acreage of very good oil bearing possibilities. The area lying a mile west of the then only crude-producing well in the north end of Turner Valley was, we assumed, the real source of the crude oil being produced at Model No. 1 Well.

We derived our theory from the fact that every well drilled east, structurally, of the Model well produced Naptha, accompanied by a large volume of gas. We had as an example, Foothills #1, Spooner #1, Richfield #2, etc. Although Model #1, too, came in as a Naptha well, its production turned to crude oil within the first year of its life, producing about 175 barrels daily.

It was with these conclusions in mind that we made application for some 2,000 acres of Petroleum and natural gas leases.

Since these leases are to be an important factor in our story, I shall digress for a moment to describe the varied phases of them.

From the year of confederation, 1867, to the year 1887, the Dominion Government disposed of millions of acres of land, as grants, home-steads, and cash land sales. The government held no reserve on any of this land; for instance any and all minerals, oils, and gas that might be found on or beneath the surface of these lands went to

the new owners with their surface titles.

In 1880, Sir John A. MacDonald, Premier of Canada, negotiated in London the deal between the Government and the C.P.R. officials whereby as well as giving the C.P.R. $25,000,000 in cash and a railroad 700 miles long, values at $35,000,000, it received 25,000,000 acres of land checker-boarded, across Canada. All this was a subsidy to and compensation for building its rail line across the Dominion. We find now, many years afterwards, that very valuable mineral deposits, mainly nickel, are found on some of this land in B.C., while coal, oil and natural gas are found on C.P.R. lands in Alberta. We see at once in how favorable a position the C.P.R. Company finds itself in that it pays no share of its find in the form of royalties back to the Government.

All persons receiving land grants, or who purchased land from the government before 1887 shared in the royalty exemption privileges. These lands were termed "Free-hold Lands".

In 1887, the government, seeing that a substantial source of revenue was being overlooked, decreed that in all land titles issued hence forth, the government would retain all oil, gas, and mineral rights to itself. Prospecting privileges might be had from the government but a royalty of 5% of the production of oil and minerals recovered must be paid the Government. The word Royalty comes to us from England. In that country mines of gold and silver are the property of the crown, i.e. royal metals (hence the term) "royalty". Under the new arrangement pertaining to oil the royalty was gross, that is, if a well produced 100 barrels of oil daily, 5 barrels went to the Government.

In 1930, the Natural Resources of Alberta were vested with the Alberta Government. This Government raised the royalty from 5% to 10% therefore for every 100 barrels of oil produced, the government gets the proceeds of 10 barrels. the Alberta Provincial Government makes the same rental charge on oil leases as did the Dominion Government, i.e., 50¢ per acre per year the first year and $1 per acre a year thereafter.

Now to go on with my story. Our application for leases carried a drilling agreement, i.e., we agreed to start drilling operations within the usual allotted time. In our case the Government allowed us a period of five months in which to start operations. This lease for which we had applied, came up for public auction between New Year's and Jan. 15, of 1934. We do not know yet if it was due to the festivities at this time of the year or to the general disinterest of oilmen in this particular property anyway, we had no competitive bids, and by paying the fifty cents per acre rentals, we were given title on same.

These rentals, I may say, took nearly all our cash as the leases consisted of about 2,000 acres. This included 420 acres of schoollands of which I will say something later.

I was still employed by a company drilling the South end of Turner Valley, while Red was unemployed as things were really very slack at this time. So quiet in fact, were things, that we thought it highly probable that no matter how attractive a proposition we might offer, the public would greet it with thumbs down.

In May 1934 we managed to get the cellar dug and by Fall Red realized enough cash on some of his own securities to get the derrick erected.

We still had no drilling equipment, etc., and, of course, no money. Here Red, through his inherent ingenuity made a deal with the Model Oils and also one with the Union Drilling Company where we transferred to them some of our leases in payment as rentals on the drilling tools we were to receive from them. These companies had such tools as we needed and they were not using them.

While we had now a completed rig and the drilling tools had been arranged for, we couldn't have managed even yet if it had not been for the kindness of human nature. H. W. Johnson tended to our hauling, while Tom Fowler furnished our groceries with no more assurance of ever getting their money than our promises to pay if we were ever able.

These obligations as well as the cost of geogolical work, I am glad to say, have now been satisfactorily discharged.

By the first part of December 1934, Red had, assisted by two local boys, drilled the well to 100 feet. The weather turned very cold and not being rigged up for this inclement weather, the well was forced to close down, remaining so until the beginning of February. By this time the well, on which I had been employed was completed, so that the two of us could now concentrate all our attention on our own project.

When we started up this time, we managed to drill the well down to 1400 feet, but owing to conditions in the formation, we were obliged to suspend operations once again. We were now sitting pretty however as regards our leases. Our Drilling Credits now amounted to enough to take care of the lease rentals for a year or two with the exception of the 420 acres of school land to which Drilling Credits do not apply and which must be paid for in cash. Drilling Credits is an arrangement by which the Government allows about 1/3 of the cost of the drilling plus depreciation on the machinery as rentals for the leases--but this only applies to wild-cat acreage, the acreage that has been proven however, the rentals must be paid in cash. (Once for instance a well completed to 14,000 feet would cost approximately $15,000. The Government would credit $5,000 to apply to the rentals). To pay for the rentals on the 420 acres of School lands, I obtained a sufficient loan on my life Assurance Policy.

We were now really up against a tough problem, needing some 1500 feet of 16 inch casing costing slightly over $4.00 a foot. We had reached the end of the proverbial rope. As it was impossible for us

to go any further without some outside help, our operations were now punctuated by a long period of waiting.

Then, one nice July day hope welled up once again Red in some mysterious way got word that an Eastern Oil Co. was interested in investing in Turner Valley Oil prospecting. It finally was agreed that Red go east and that if a deal was not arrived at the Eastern company would pay the expenses involved in the trip. Red forthwith went down east and after only 36 hours in the eastern city, arrived back triumphantly with enough money to purchase the required 1500 feet of casing, leaving sufficient cash on hand to drill the well down another 1000 feet.

We were truly optomistic that at last we had tapped the eternal pool of what it takes to drill oil wells. But it was not to be so simple as this. This source was soon closed to us as the Eastern Company thought that maybe after all it was only throwing good money after bad. It wished to be released from all obligations of furnishing us with further funds. We were obliged to accept, much to our disappointment. At 2400 feet operations on the well again ceased.

We felt cheered, however, in one respect, Dr. "Pete" Sanderson, a geologist, and also Mr. Vern Taylor, then a Government geologist, were firmly convinced that we had penetrated the Belly River formation, overlying the Benton, at approximately, 2310 feet. We felt hat, armed with this talking point, we should surely interest somebody. We reasoned that some Turner Valley Oil Companies should go for this as our leases were neighboring theirs.

After interviewing a good many of the directors of the various companies, it looked everything but hopeful. One set of directors suggested that if Red could get about three or four companies interested that they would "go" too. Red tried hard, but finally gave up this discouraging "unorthodox panhandling". He said it was worse than trying to start a string of balky mules, and here Red speaks with authority, having been on very intimate terms with mules on Texas rice farms. When one would go forward, invariably the rest would go backwards. They just couldn't get together, numerous deals were nearly closed but somebody or something always intervened all negotiations proved fruitless. Red also made a couple of trips to the West Coast but it seemed that the only trust in Turner Valley at that time, was in the south end. Here, though, was Model #1, our next door neighbor which had produced over $1,000,000 worth of crude oil since coming into production, May 1930.

Between May and June 1936, events took a sudden turn when Turner Valley Royalties Well came in with 800 barrels daily. This slowly revived oil consciousness in the public. Though this consciousness did not readily migrate to the North end of the Valley, things in general were looking brighter. Several new Companies were now organized on the west structure. Old ones that had been holding leases in this area reorganized. Slowly but surely the old speculating yen was once more entering the soul of the public. By thm end of the year this

trend was so marked that we decided here, at last, was the moment of our lives, and immediately we set to work organizing our company, to get a Charter.

Getting a Charter is comparatively easy; the cost of the Charter being the greatest obstacle. This cost varies with the capitalization of the Company, rising as the capitalization rises. The services of a lawyer are required to draw up the necessary articles of Incorporation, i.e., the intentions of and the purposes for which the Company is being formed.

The charter is issued by the Registrar of companies. It is only when the company goes to the public for money for its project, that details enter the picture. A detailed statement of the company's objective program must be submitted to the Public Utilities Board for examination. This Board checks this plan--the operations and details of the business which the company proposes to carry on. Particulars must be given as to: the office location, number of shares offered to the public, the capitalization, the description of the property, the price paid for this property, the amount of royalty retained by the vendor, the geological survey report, the financial position, how the money is to be used, names and addresses of all directors, amount of shares held by each director to qualify them as directors, how the dividends are to be declared, and finally the last auditor's financial statement.

Having forwarded all this information to the Board, it in due course found nothing objectionable and issued our permit to offer stock to the public. Our issue was for 200,000 shares at 25¢ apiece.

We then established a business office at 816, Lancaster Building. Our subscription was oversubscribed in three days.

We were now ready to work again but we had first to submit our banking account to the Board of Public Utilities, so that they could ascertain that all the money had been paid to the company's account.

We held up to this time only a permit to our surface rights, i.e., the few acres used by our derrick, etc. We now purchased the surface rights of the quarter containing the well site. Very fortunately there was sufficient water on the place, for drilling purposes.

At last our old mill was grinding again. We bought 4500 feet of 10 inch casing. We ran this when we reached the depth of 3800 feet and carried it to 4170 feet. Here misfortune struck, what seemed at this time, its fatal blow. On lowering the pipe September 6, 1937, one of the shelves on top of the derrick broke. Well, you can imagine what would happen, when about 100 tons of weight falls 30 feet and land on a surface of 10 ¾ inches in diameter. We had been looking for the cardium sandstone before obtaining more money. Now the Fifty Thousand had reduced to an exceedingly low figure and an expensive fishing hole was staring us in the face. We let two crews go. Red and I went off the payroll, but kept up one shift a day with one other

to help. We kept on with our weary fishing gole for some time. The pipe had broken in pieces some 1000 feet long, others about 500 feet, and others about 1000 feet. We were able to get most of the pipe out.

When we were nearing the end of our job, we made a lease deal with the Home Oils. They bought a large block of our leases for $80,000. Once this deal was closed, our fishing gole was over, the pipe was put back and cemented.

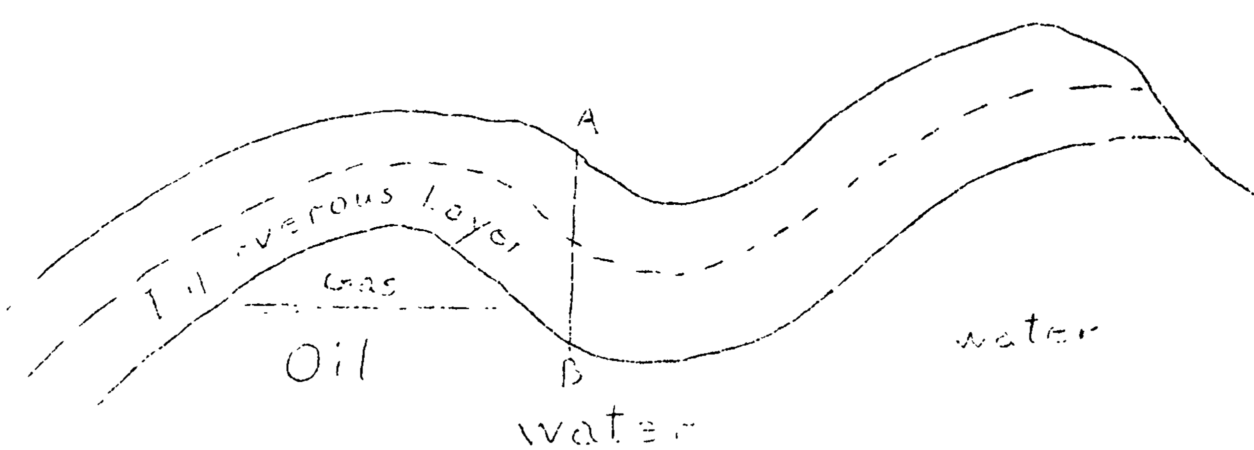
Then we made a contract to have the well completed by a rotary rig. This rig set to work April 18, 1938. We believe now that dropping the pipe or casing was good fortune instead of bad, because since we didn't reach the Cardium until 4850, and met it again at 5800 feet, we will not reach the Madison Lime until approximately 7500 or 7800 feet. With cable tools it would take us three years.

After completing the deal with the Home Oils, we had sufficient money to cover the cost of finishing the well. At this time then, we applied to the Board of Public Utilities for permission to put our stock on the Stock Market. Stock cannot go on the Stock Market until a company can prove it has sufficient capital to complete the well. We also had to pay the Stock Market a fee before our stock could be listed.

We are now 6450 feet deep and barring bad fishing jobs, etc., should have sufficient funds to make it this time--here's hoping!

WHAT MAKES THE OIL COME UP?

This is an imaginary diagram of a cross section of Turner Valley.



A tremendous thrust from the west caused the earth's crust to buckle up into anticlines and synclines. Below the imperverous layer the porous limestone contained salt water and Petroleum oil.

Pressure and heat caused some of the oil to change to gas. Gas takes up more space than oil from which it is distilled and is lighter than oil, so the gas would collect at the top of the anticline and press down on the oil. The oil being lighter than the water would drive the water still further down, so now you see there are two things causing pressure.

1. The gas which has changed from the oil and is taking up more space, is pressing up on the strata above and pressing down on the oil below.

2. The water that has been driven out of the space occupied by the oil is pressing up on the bottom of the oil.

It is thought that the water in Turner Valley is at a higher level further west than the oil in the anticline (see diagram). This would add still more pressure to the oil. So that if the west flank were tapped at AB, three factors would cause the oil to rise.

1. Pressure due to part of the oil changing to gas and thus taking up more space.

2. Pressure due to water having been driven back by the oil and gas and trying to move upward and take its place.

3. The water being at a higher level some place west of Turner Valley.

From this you can easily see the need of preventing wastage of the gas of Turner Valley, i.e., conservation.

1. If the gas from the apex is allowed to escape, it will bring very little oil up with it.

2. If it escapes the pressure due to the gas will decrease and therefore the oil will not be pressed upward with as much force.

3. If the gas is lost the oil will be driven upward to take its place and water will take the place of the oil so that the well at AB will produce water instead of oil.

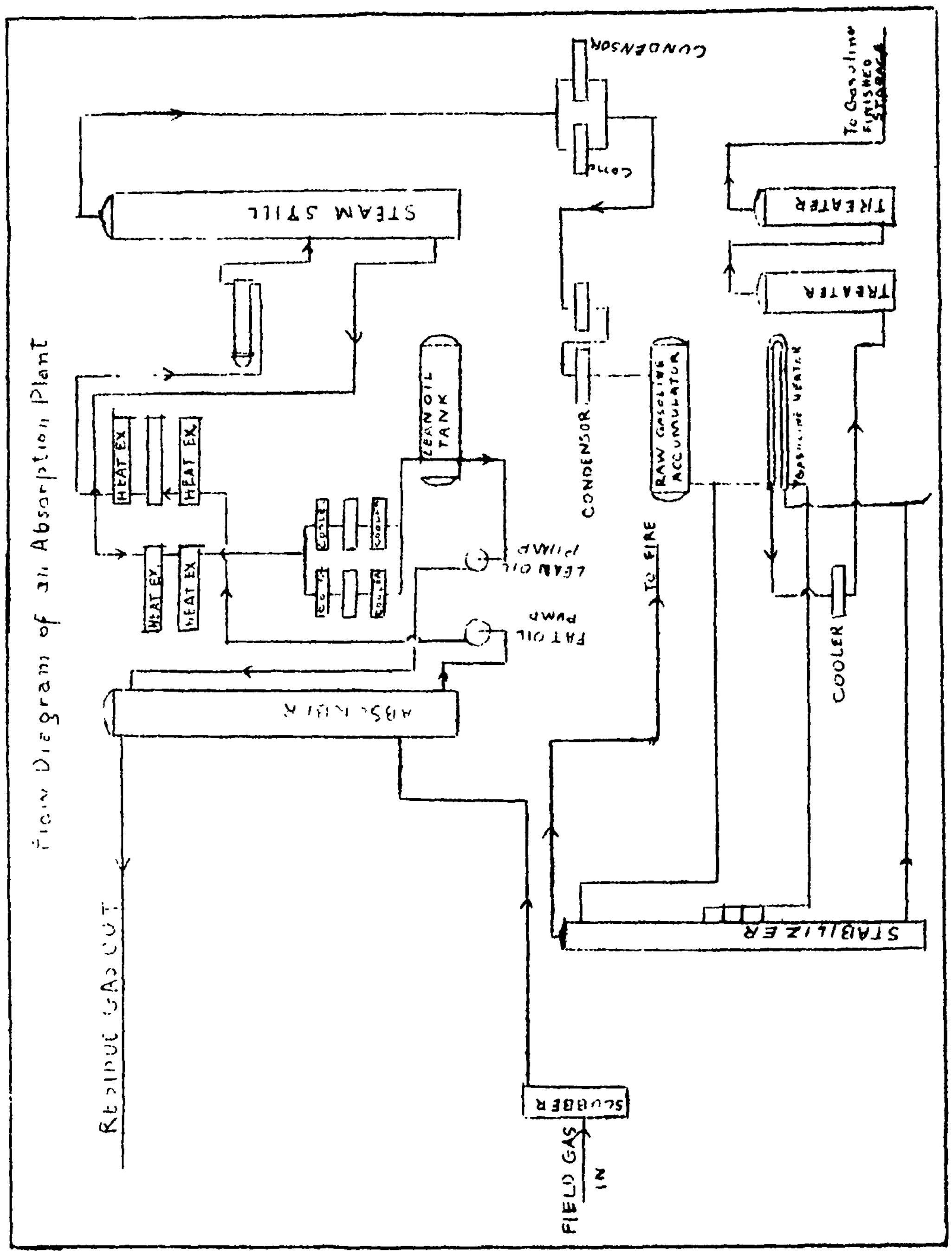
ABSORPTION PLANTS.

After the search for naphtha abated and Turner Valley was assured of an adequate gas supply, the major operators turned to more efficient means of gasoline extraction than that afforded by mechanical separators. For a number of years gasoline plants have been operating, utilizing the absorption of lighter liquid gases by heavier oils of low gasoline content. The gasoline plants erected in Turner Valley are all of this design.

By 1931 a major company had one such plant in operation capable of handling in the neighborhood of seventy five million cubic feet of gas daily. This was followed by a second companies plant in 1934. The third absorption plant was built in 1935 and the fourth in 1936. At the present time Turner Valley has absorption plants capable of handling well in excess of two hundred million cubic feet daily.

Gases and gasolines are composed of series of hydrocarbons of different chemical structures. Some of these are liquids at given temperatures and pressures while others are gases. Of such a mixture is the gas from a naphtha producing well. By mechanical separators it is possible to separate some of these liquid hydro-carbons from the mixture. The liquid separated in known as naphtha. The remainder goes over along with the dry gases. Before the erection of absorption plants these unextracted liquid gases were burned in the flare along with the dry gas. Now a large percentage of the residue gas from the mechanical separators goes to absorption plants where practically the last drop of liquid gas is extracted before the dry gas finally finds its way to the flare where it is burned.

The gas is measured when it leaves the well by flow meters. The gasoline content of the gas from each well is determined by the Charcoal Absorption Test to determine the B. P. M. (Gallons per Thousand


Flow Diagram of an Absorption Plant
STEAM STILL
CONDENSOR
Cond
To Gasoline Finished Storage
TREATER
TREATER
LEAN OIL TANK
HEAT EX.
HEAT EX.
HEAT EX.
HEAT EX.
CONDENSOR
RAW GASOLINE ACCUMULATOR
LEAN OIL PUMP
FAT OIL PUMP
TO FIRE
COOLER
ABSORBER
STABILIZER
SCRUBBER
FIELD GAS IN
RESIDUE GAS OUT

cubic feet). Before entering the plant the gas from the several lines enter a common line to make up the composite gas supply of the plant. The gas first passes through scrubbers to remove any dust or foreign particles. From the scrubbers the gas enters the absorbers. These are tall steel towers about sixty feet in height and approximately ten feet in diameter. They contain the lean oil i.e. a moderately heavy oil of very low gasoline content. The gas is cycled through this lean oil which absorbes as nearly as possible all the liquid gases. The dry gas then goes over the top of these towers and on out to the flare. The oil containing the absorbed gasoline, which is called fat oil, is then pumped to the steam stripping still where the temperature is maintained sufficiently high to distill over any gasoline lighter than the lean oil. After being stripped of the gasoline absorbed in the absorbers, the absorption oil is pumped through cooling coils where it is cooled back to its original temperature by cold water falling over the coils. Then it goes back to the absorbers completing its cycle in the absorption process.

The gasoline goes from the steam still to the stabilizer which is another tall tower just as high as the absorbers but only about three feet in diameter. The purpose of this stabilizer is to separate those liquid gases that will be liquid at ordinary temperatures and pressures from those that are liquid at temperatures lower and pressures higher than atmospheric. The common practice is to stabilize the gasoline so as to contain the hydrocarbon butane and any other heavier and rejecting anything lighter than butane. This is accomplished by carefully controlling the temperature and pressure on the tower.

This gasoline then goes through heat exchangers and coolers and then on its way to the treaters where corrossive and odorous sulphur compounds are either removed or changed to non-corrossive and odorless compounds. After this treatment the gasoline which is said to be sweet, is pumped to finished gasoline storage.

This absorption gasoline is a good quality product having a good octane rating but is of a comparitively high gravity. It is used principally as a refiner's blending product in the manufacture of finished motor gasolines.

A plant once in operation is practically automatic. All pumps are set to pump at a constant rate. The different temperatures and pressures are all automatically controlled by instruments which record each variation upon a chart. An operator has only to look at these charts to know what is taking place at any point in the cycle.

A laboratory is always maintained to keep close control on each phase of the cycle. Absorption oil must be maintained at specified molecular weight, gravity, etc., the gasoline must be of certain standards, gas has to be checked for its gasoline content, etc. Although chemistry plays an important part in the precess, the whole theory of absorption is a physical one. No chemical

reactions take place till the final treatment for the sweetening of the finished gasoline.

REFINING OF CRUDE OIL.

Petroleum oil, in its crude state, is of little use in modern life, and therefore, following its delivery into a tank at an oil refinery, it has to undergo a refining process, the basic function of which is to extract from the crude oil the various products demanded by the modern market. The principal products of crude oil called for in the modern world are gasoline, kerosene, fuel oils and oils and greases in all their varied forms.

In order to understand the mechanics of the refining process, one must remember that the chief, and most important constituents of crude oil are the hydrocarbons, or various groups or arrangements of the two elements hydrogen and carbon. There are other forms of matter in crude oil, such as oxygen compounds, sulphur compounds, nitrogen compounds, and other impurities such as sand, water and mud. These latter, however, are usually separated from the crude oil in the field by a settling process, and are not found, to any great extent in the crude delivered into a refinery tank.

The hydrocarbon constituent is the valuable part of crude oil which is refined and processed into a marketable product, while the sulphur, oxygen and nitrogen compounds are eliminated as undesirable ingredients in a product backed by a reputable refinery.

The hydrogen and carbon atoms which combine to form a hydrocarbon molecule are found in several hundred different combinations, each combination being a definite substance, and having its own characteristics of gravity, viscosity, boiling point and condensation point. In crude oils many molecules of different combinations are found all together as a mixture, forming a series of hydrocarbons ranging from light gases and high gravity gasolines, heavy gasolines, kerosenes, gas oil, lubricating oils and down the line to asphalt, these are all mixed together in the natural state, and it is the separating of these various hydrocarbons into groups having approximate characterists which is the main task of a refinery. This is done by taking advantage of their different boiling points and condensation points when the oil is heated. All refining plants employ some form of distillation in processing the oil, some quite simple and others quite complicated and involved, depending upon the range of products to be manufactured and the quality of them. The simplest form of distillation plant is known as a "Batch Skimming Plant" in which a cylindrical vessel of three or four hundred barrel capacity is partly filled with crude oil, and slowly raised in temperature by means of a fire in a brick firebox built under the still. As the temperature rises the light fractions begin to vaporize and boil off. These vapors are conducted by means of a large pipe to a point near the bottom of an insulated dephlegmating tower, in which a series of plates and bubble caps are placed to

force the vapor from the still to come into contact with oil which has been just of the proper gravity to vaporize, but which condenses as soon as a slight drop in temperature is effected. In consequence of this fact the plates of the dephlegmator are covered with an oil film which is heaviest in gravity at the bottom of the tower and lightest at the top, and the vapors passing through the tower are thus scrubbed to eliminate any impurities which may be entrained with the vapor, and also the heavy vapors are condensed and given an opportunity to run back to the still by means of a "run back" line from the bottom of the tower. The vapors which actually reach the top of the tower, and not condensed, are tolerably free from impurities and are of similar characteristics with regard to gravity, boiling and condensation points. To further insure that this vapor is of uniform characteristic, a coil is often placed at the top of the tower and by this means the temperature of the vapor leaving the tower can be controlled. The vapor leaving the tower is conducted by means of a large pipe to a condenser coil submerged in water, where the vapors are condensed into a liquid and run into a run down tank. A constant record is made of the gravity of this liquid as it runs into the tank.

The first liquids to vaporize and leave the still as it is heated are what is known as the "light fractions" or light gravity gasoline, and as the temperature of the still is raised the heavier gasoline vaporizes off also, than as the temperature continues to rise the kerosene, gas oil and still heavier oils are distilled off. To allow all these products to run into the same tank, however, would be merely transferring a mixture of oils from one container to another. In order to separate these products into ranges which are marketable, the man watching the gravity of the condensed liquids leaving the condenser cuts the stream into different tanks when the gravity reaches certain predetermined points. In other words, the gravity of the first liquid to leave the still might be as high as 70° B', and as the temperature of the still is raised, the gravity of the steam gets heavier. When the gravity of the stream reaches a certain point, say 60° Bé, the stream is cut to another tank. The refiner knows by previous trials that when running a certain crude, the average gravity of his tank will then be the required gravity of say 66° to 68° Bé, which is a light gasoline for special motors. He then lets the steam run into the second tank until the gravity of the stream is say 54° Bé, which will give him an average tank gravity of 60° Bé, or ordinary gasoline stock. The stream is similarly cut into o6her tanks for kerosene, gas oil and other stocks which they may require for special purposes of sale or processing. When all such stocks have been taken off, there still remains a large percentage of the original charge in the still which is pumped through coolers to a separate tank for sale as fuel oil or road oil.

The products thus separated by distillation are still not suitable for the market as they stand, but have to be subjected to a treating process to eliminate undesirable elements, such as resins and sulphur compounds that even distillation will not

separate from the products.

The treating process, like the distillation process, might be of a simple nature or quite elaborate, depending on the quality of stocks to be marketed. Gasolines and kerosenes may be sour from the presence of sulphur compounds or yellow in color from the presence of gums and resins. Sulphur compounds in gasoline gives off obnoxious odors on burning, corrodes machinery, and burns poorly. This impurity is usually eliminated by agitation, with sulphuric acid in specially constructed tanks. This process must be followed by neutralization by means of agitation with caustic soda and then washed with water to take out any trace of soda, acid or neutralized matter. Kerosene is treated in a similar manner, but gas oil is rarely treated. If a tractor fuel cut has been made it may or may not be treated.

In addition to the above treating, and to further eliminate the sulphur compounds, an additional treatment is used after the acid treatment by agitation with a sodium plumbite solution (solution of lead oxide or litharge with sodium hydroxide or caustic soda), and powdered sulphur, this latter being added when necessary to secure the separation of the sludge formed from the gasoline.

Refineries using the acid process have to have facilities for recovering and concentrating as great a percentage of the acid as possible. There are other methods of treating oils, each of which requires its own type of equipment, and in the larger refineries this equipment is quite elaborate.

The batch still process described earlier is quite elementary, and was chosen in this instance because it is so much easier to underatand than the more involved processes usually used. From an understanding of the simple batch still process however, it is much easier to understand the other more complicated plants, which are more efficient and will process a greater quantity of oil for the money invested.

In the larger refineries the one batch still is replaced by batteries of three or more stills, each having a capacity of around 800 barrels, and each still is held at a constant temperature. The crude oil is pumped from the charge tank, gauges of which are taken at regular intervals. The charge pump is usually automatically controlled by an instrument which hold the charging rate at a definite quantity. From the pumps the oil is passed through "heat exchangers" and "partial condensers" which serve the dual purpose of cooling the "vapors" or "bottoms" leaving the stills and at the same time preheat the new crude oil going to the still. The oil enters the shell of the still and is discharged into the hot liquid of the still by distributing pipes to avoid chilling one portion of the still more than another.

The temperature of this first still is maintained at a point which will immediately vaporize the hydrocarbons of the series having a gravity close to the first cut to be taken off and including some of the heavier cut. These vapors all rise up out of the still and enter the dephlegmator or bubble tower, ahe heavier ends condense on the plates or on contact with the "partial condenser" tubes and run back down the tower and back to the still. The vapors of the required condensation or dew point pass on out of the tower to heat exchangers and condensers to the run down tank. This first cut is usually a gasoline. The oil left in the still which is too heavy to vaporize at the temperature maintained in the still is allowed to "flow" into a second still, this flowing process is usually assisted by a steam lift column, so that the oil passing to the still first enters the lower section of the tower of the second still, to mingle with the condensed vapors running back into that still.

The temperature of the second still is maintained at a degree of heat somewhat higher than that of the first still. If for instance the first still was maintained at a temperature of 510° F, the temperature of the second still may be held at 550o or 560° F, and the lighter oils of the charge entering the second still immediately vaporize and enter the tower, some heavier ends condense and run back to the still while the lighter oil vapors pass on out of the tower as did those described in the first still, and are run into a second tank, this second cut is usually of the kerosene series.

The oil left in the second still is passed into a third still where a still higher temperature is maintained, and the liquid leaving the condenser of this still is run into a third tank. This liquid may be gas oil, diesel or tractor oil, or a high grade fuel oil, depending on conditions maintained on the stills. All the operations in connection with these stills must be necessity be held constant, or the whole system will be thrown out of balance, and for this reason the charging rate, and the temperatures of the the stills and partial condensers are automatically controlled by flow instruments and thermostats.

The products from these stills have to be treated to eliminate impurities, and the same process as was earlier described has to be employed. Some of the more recently evolved systems of treating are preferable to the acid and soda systems, because of the absence of objectionable odors which are an unavoidable part of the acid-soda treatment.

In refineries which have a cracking plant, the oil left in the last still of a battery, plus any of the heavier processed oils which are off specification or surplus stock, are charged into a cracking coil where the oil molecule is broken up by heat and pressure into other hydrocarbon combinations of lower carbon ratios; that is, the heavy oil molecule is broken up into hydrogen and carbon atoms and reunited into other combinations having fewer carbon atoms in proportion to hydrogen atoms, which ends in a vaporized oil mixture containing hydrocarbons from high gravity gases, down the series to

gasolines, kerosenes, heavy oils and to hard coke. This mixture is separated more or less into the required products when the vapor leaves the coil and enters the drums and partial condensers. These products however have to be rerun in stills similar to the crude stills, in order to obtain products of the required specification, and these also have to be treated to eliminate the resins and sulphur compounds.

Every step in the processing of the products from crude oil is watched carefully by men specially trained in each particular operation, and a staff of chemists is constantly testing the products to be sure that they are up to specification before being placed in the final storage tanks, and ready for transportation to the market centres.

The usual range of products manufactures by the Alberta refineries are high grade gasoline suitable for an admixture of tetraethyl lead for ethyl gasoline, straight commercial gasoline, kerosene, tractor fuel or diesel fuel, high grade fuel oil, road oil, asphalt and coke. The various other products of petroleum oil such as lubricants, waxes, medicinal oils and cosmetics are not manufactured by the refineries of Alberta, owing to the fact that the manufacture of these commodities would entail investment in special equipment which would not be economically sound.

F. Tempest R.P.E.

Examples of Poems written by average Grade 6 pupils of a Rural School.

FIRE IN THE OIL FIELD

The oil field's afire, the drillers shout--
And for their safety they run for help.
The fire's roaring, the fighters in fear
For fear of the derrick and buildings near.

OIL.

Way down deep in the dark, black soil
Is a rich brown mineral which is oil.
Men drill and drill in the deep hard ground
Till this wonderful mineral at last is found.

It is brought to the surface and in factories refined.
It is far more useful than all the gold mined.
It runs large engines and big shiny trains.
It sends cars bumping through long country lanes.

In the transport it comes in a big bulky load.
Then we all know enough to get out of the road.
For all must have oil without any delay.
The engines must run on their errands today.

Now to the end of my book you read.
And I hope you have found that just as I said.
Oil's most important on the whole earth
A hundred pounds of gold it is worth.

We hope we never run out of oil
For which our men will toil and toil.
But until it does we'll try and get
The oil that's under the surface yet.

The healthful balm from nature's secret spring
The bloom of health and life to man will bring
As from her depths the magic liquid flows
To calm our sufferings and assuage our woes.

OIL.

Oil, I suppose, as you have been told
Is a sticky, black substance often called black gold.
Many years ago it was formed in the earth
Long before our grandfather's birth.

Many a man has drilled and drilled for it,
But what's he received from his laborious toil.
Many of his neighbors thought it funny
While drilling for it he lost all his money.